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ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

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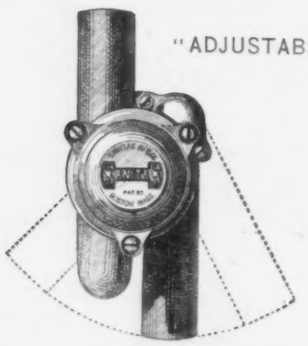
"RIGHT HAND."



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WE had the pleasure a few days ago of witnessing the application to an electric motor of a test which has, we believe, never before been applied to such machines. The motor was a large one, of the Sprague type, rated at fifteen horse-power, and was set up for use in driving two elevators in a mercantile building. The plant was a very compact one. The elevators ran in brick shafts, side by side, in the corner of the building. The motor was bolted to heavy timbers placed on the floor in the angle formed by the wall of one shaft and the main wall of the building, and a belt was carried from the small pulley on the motor-shaft to a thirty-inch pulley on a counter-shaft hung from the ceiling about ten feet away. Two more pulleys on the counter-shaft transmitted the power back again, one to the shaft of the worm-gear of the larger elevator, which was placed on the floor near the motor, and the other to the corresponding shaft of the small elevator machine, which was suspended from the ceiling nearly over the other. The motor-shaft, with a current supplied from the Edison station, made about fourteen hundred revolutions a minute, and the counter-shaft about four hundred. The Sprague motors are guaranteed, with a current of proper electro-motive force, to develop the power at which they are rated; and the object of the test was to determine mechanically, independent of electrical measurements of the current, whether the one in question did so; and for this purpose an Emerson power-scale was attached to the counter-shaft, to measure the exact amount of mechanical force developed at that point. If the power-scale could have been attached to the motor-shaft, the power developed could have been determined directly, without any allowance for loss in transmission; but the shaft, carrying only one pulley was too short to attach the apparatus, and its high velocity would have made it almost impossible to get accurate readings, even if other circumstances had been favorable. By attaching the scale to the counter-shaft, the ascertained power would be less than that actually developed, by whatever allowance must be made for the slipping of the main belt, which could not readily be determined, but no more accurate test seemed to be practicable. The first test was made by loading one elevator with a ton and a half of goods, increasing the load to four thousand and ten pounds, and noting the time consumed in making the trip, as well as the indications of the scale, while the electrical pressure was at the same time observed. The motor lifted the weight of four thousand pounds without difficulty, and the other elevator was then loaded, at first with eleven hundred pounds only. In order to avoid the excessive strains, together with the sparking of the brushes, which would follow from starting both elevators, heavily loaded, at once, an interval of a few seconds was allowed to elapse after starting the large one before pulling the shipper-rope of the small one, and both were then raised without difficulty. With fifteen hundred and sixty-eight pounds on the small elevator, and four thousand and ten on the other, both elevators made their trips nearly together, without any difficulty, although there was a good deal of sparking of one brush; but on adding three hundred pounds to the weight on the small elevator, although both elevators started, and moved some distance upward, the strain of the load, added to the great friction, which kept several of the journals smoking, made too great a demand upon the current, and the safety-plug, which forms the connection with the outside lines, gave way, cutting off the current. A simple calculation then showed that with fifty-five hundred and seventy-eight pounds on the two elevators, lifted eighty-one feet in one minute and thirty-five seconds, a force of a little less than nine horse-power was exerted at the elevators. The power-scale reading at the same time showed that twenty and seventy-seven one-hundredths horse-power was developed at the counter-shaft, and the electrical readings, reduced, showed a somewhat greater electrical horse-power consumed by the motor. The difference between the force at the counter-shaft and that exerted in raising the load, was, of course, consumed by friction in the elevator machinery, and the uncounterbalanced weight of the elevator platforms, which would amount to about five hundred pounds. Undoubtedly, with a little adjusting and smoothing of the new elevator machines, the loss by friction would be greatly lessened, and it is a matter of considerable interest to those who use electric motors for furnishing a given power to know that, if all are like the one tested, a certain extra force can, on occasion, be obtained from them, as it can from a steam-engine. The other point determined in the present instance by the test, — that of the loss by friction in a well-made elevator machine, can hardly be said to have been authoritatively decided, as such machines are usually thought to consume much less than half the power supplied to them in friction, and the heating of the journals showed that there were here some extraordinary obstacles to free working.

A GOOD deal is to be learned from the official specifications for the buildings of the Paris Exposition of 1889, which are published at intervals. In the specification for iron roofs, particularly, are to be found many interesting, and to us rather novel details. Of course, these great roofs are composed of innumerable pieces of wrought-iron riveted together, and every portion of the work is provided for. To try the quality of the metal, two tests are required, one applied to the hot iron and the other to the cold. The hot test for plate-iron is a very simple one, consisting in the rolling of a specimen from each lot of plates into a cylinder, the height and diameter of which are each to be twenty-five times the thickness of the plate. The finished cylinders are to show no cracks or signs of rupture. For the cold tests, specimens of a given size are required to resist a tensile strain of at least twenty-eight kilogrammes to the square millimeter before breaking, and to show a lengthening of at least three per cent. For angle-irons, one hot test consists in rolling samples into a circle, in which one leg of the iron shall form a cylinder, whose diameter shall be five times the breadth of the other leg, while the second leg, after rolling, shall form a flange at right angles at all points with the cylindrical surface. The second hot test consists in opening samples of the angle-irons until the legs form an angle of one hundred and thirty-five degrees with each other; and the third test consists in closing the legs together until they enclose an angle of forty-five degrees. The cold test of the angle-irons is a tensile one, but a higher resistance is demanded than in the case of the plates, the angle samples being required to resist an average strain of thirty-four kilogrammes to the square millimeter before breaking, and to elongate to the extent of nine per cent under that strain. The cold test for I-beams is the same as that for angles. The hot test consists in splitting a sample through the middle of the web to a distance from the end equal to three times the depth of the beam, drilling a hole at the end of the split to prevent it from extending further, and then heating the sample and separating the two portions until the space between them at the extremity is equal to the depth of the beam. All the specimens of iron are required to bear these tests without cracking. The directions for riveting and setting in place are as minute as the others, and the portion of the specification relating to painting is curious in many respects. Instead of daubing the iron with paint, over the rust and

dirt, the pieces as well as metal, are, as soon as they are drilled and fitted, to be scraped and cleaned all over, so that no trace of rust shall remain, and are then to have a coat of linseed oil, which must be put on under cover, or at least in dry weather. After drying, the oil coat is to be scraped and smoothed, and such portions as are put together in the workshop are then to be riveted, and immediately afterward painted all over with red lead. After setting in place at the building, the work is to be examined, new rivets and joints and portions scraped in handling retouched with red lead, and the whole then painted with a final coat of red or white lead, as shall be directed by the architect. The colors are in all cases to be ground with drying oil and thinned as required with equal parts of linseed oil and turpentine.

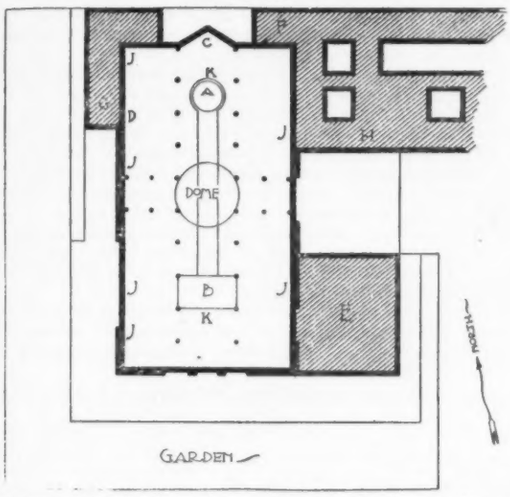
A STORY is published in the New York *Mail* and *Express*, to the effect that the great Eiffel tower in the Champ de Mars in Paris, which was to be one of the most striking features of the Exhibition of 1889, is to be abandoned. The structure is already built about a hundred and forty feet high, and it seems very singular that such an enterprise, in full process of execution, should be suddenly given up; but the *Mail's* correspondent says that workmen cannot be found who will risk their lives, as they think, on the structure. We have as yet no information in regard to the matter from French sources; but it will seem a little strange if, so soon after the Germans have finished two stone towers, five hundred and ten feet high, and the Americans one of five hundred and twenty-five feet, the courage of the French should give out at an elevation of one hundred and forty feet, on an iron structure, which affords infinitely better facilities for arranging good and safe scaffolding than a stone tower.

ARCHITECTS in active practice generally take much interest in the professional schools which prepare for them the young men who are to be their assistants and successors, but do not always know how much they can do, without very great effort, to promote the efficiency of such schools. One of the most serious dangers to be avoided in the conduct of a technical school is that of allowing it to drift away from the problems of actual professional life, and become absorbed in theory, to the exclusion of practical application of the principles which have been taught. In dealing with so many-sided an art as that of architecture, it is particularly necessary to see that no portion is taught merely as an abstract subject of thought, but that all parts are vivified by references to existing examples, and the observation of actual processes and results; and in the attainment of this end the coöperation of the profession outside is of great use. The perfect institution of technical learning, while never abandoning for a moment its high standard of scientific attainment, should be in constant sympathy with the exterior professional world, sharing its interests, and trying to utilize both its successes and reverses in making its own teaching more efficient. For this purpose, in a school of architecture, frequent and direct communication with practising architects is of great value. Any school worthy of the name would keep itself informed, by means of the technical journals, in regard to what was going on in the profession, but this does not take the place of direct communication, by personal visits, the gift of photographs and drawings, or of details of construction, or sets of plans; which, although every-day matters in architects' offices, seldom find their way to the schools, where they are highly prized, not only for their practical air, which gives them an interest far superior to that of the stock diagrams in the text-books, but for the help that they give in illustrating contemporary developments in architectural science, which are not usually shown in text-books for years after they have become familiar in the profession.

THE rival schools of archæology at Athens accomplish an immense amount of work, which would probably never be attempted except for their efforts. According to the *Messager d' Athènes*, the pupils of the French school at Athens, under the direction of M. Gustave Fougères, have undertaken explorations at Mantinea, the principal city of ancient Arcadia, and the scene of the great battle between the Thebans under Epaminondas and the united forces of nearly all the rest of Greece. Although Arcadia was a pastoral country, and Mantinea a comparatively rude provincial town, the excavations have brought to light well-paved streets, a market-place surrounded by a portico, a large number of fragments of Doric colonnades, and many beautiful fragments of sculpture, a few of which date only from the time of the Romans, while the others are of various periods of purely Greek art. In certain respects, Arcadia is the most interesting portion of Greece. Curiously enough, no one seems to know whether the present inhabitants of the peninsula are descended from the ancient Greeks or not. It is certain that after the fall of the Roman power great numbers of Slavic barbarians, like those who colonized the present provinces of Bulgaria and Roumelia, just to the north, invaded Greece, and, notwithstanding the persistence of the ancient language, in a modified form, there are many archæologists who assert that the small, black-haired, olive-skinned people who inhabit nearly all the territory of ancient Greece, and call themselves by the antique Greek names, are pure Slavs, without a drop of Hellenic blood in their veins. What has become of the ancient race they do not pretend to say positively, but they believe that it was almost entirely exterminated by the Northern invaders, and, in proof of this position, they point to the present Arcadian mountaineers, who are tall and handsome, with fair complexions and light, curling hair, such as the Greek poets describe, and Phidias represented in his sculptures, saying that the original Hellenic inhabitants, flying before the barbarous hordes of the Dark Ages, took refuge in the mountains, and there alone, defended by Nature, have been able to maintain themselves, and repel the advances of foreign enemies. In opposition to this theory, a later school of archæologists professes to have discovered that, instead of being pure Hellenes, the fair-haired Arcadians are pure Slavs, the descendants of those who, after their invasion of the country, had been forced by a revolt to take shelter in the mountains while the dark-haired natives, the true offspring of the ancient Greeks, were engaged in the effectual extermination of all the Slavs who remained in the accessible parts of the country. There would seem to be a tolerably wide liberty of choice between these two theories, but a third is offered, founded upon the fact that the Arcadians in classic times believed themselves to be of an aboriginal race, far more ancient than that of the people who inhabited the low lands around them, which suggests that instead of being either Hellenes or Slavs, the handsome mountaineers may possibly be the surviving representatives of a Pelasgic or other prehistoric race, while the small lowlanders are of a descent so much more recent that it is of small importance whether they are Greeks or barbarians in blood, or a mixture of both. The ethnology of the Alpine valleys, in which are said to be found remnants of every race which has ever invaded Europe, indicates the possibility of the persistence in the Peloponnesus of an aboriginal type, and the explorations at Mantinea, if they bring to light nothing else of importance, may perhaps serve to clear up this curious question.

A GOOD many years ago, according to the veracious history of Ovid, a young man who had succeeded in borrowing a pair of wings, and a cap which made him invisible when he put it on, together with a diamond dagger, went on a hunting expedition after Gorgons. His somewhat unusual equipments brought him success, and he returned home with the head of his quarry as a trophy. On the way a drop of blood from the head fell to the ground, and immediately turned into a winged horse, which flew over the sea, and alighted on a wooded hill. Here he pawed the ground, and a spring gushed out. This attracted the attention of the people of the neighborhood, and the winged horse was captured and tamed; and, after a few years of usefulness, flew up to the sky, where he may still be seen; while the spring which he evoked continues to flow. Unfortunately, the climate of the locality has apparently changed since Jupiter's daughters danced upon Mount Helicon, and the spring of Hippocrene, together with the rivulet on whose banks the Graces once lived, now serves to feed a gloomy swamp, so poisonous in its emanations that the inhabitants of villages ten or twelve miles distant often die from the effect of the malaria. After two thousand years of endurance, they have at last taken decisive steps to remove the trouble, and a canal is in process of construction which will drain the swamp, or rather the Lake Copaïs, and convert it into an arable plain. The lake lies high enough to drain naturally into the sea, but three ranges of hills intercept the direct route, and it will be necessary to tunnel all of them to obtain a free outlet. When this is done, an area of more than sixty thousand acres of extremely rich land will be secured for cultivation, and the cost of the work, great as it is, will be well repaid.

THE INTERIOR OF THE CATHEDRAL IN THE CITY OF MEXICO.

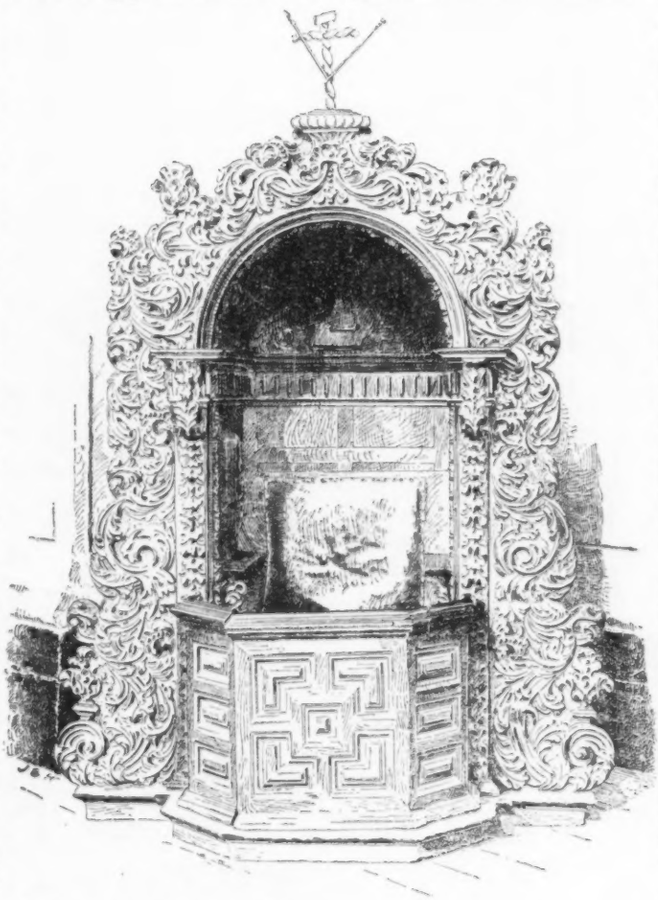


THE great Cathedral in the city of Mexico has been so frequently pictorially represented to American readers that its outlines must be by this time quite as familiar as those of St. Paul's or Westminster Abbey. If this be not so, the present reader can turn back to *The American Architect and Building News* of September 19, 1885 (No. 508), and find there a double-page illustration of that magnificent structure, showing its exterior to a good advantage. All that could be added to that illustration as regards the exterior of the building would be a view of the elaborately-carved "*Churrigueresque*" façade of the Sagrario or parochial church, which does not come out with sufficient distinctness in the above-named illustration. The Sagrario is in many respects distinct from the cathedral, owing its existence to a different organization, built at a much later period, and with a different object in view, but it forms, nevertheless, part of the cathedral group of buildings, from which the observer would find it scarcely possible to separate it. It is also so connected with the cathedral's interior that visitors pass from one to the other scarcely noticing that the two buildings are distinct.

Few attempts, if any, have been made to illustrate the interior of the cathedral, and it is, therefore, less familiar to those who have not visited it. The purpose of this paper is to so illustrate it by means of views, with only so many words as will be necessary to explain the pictures.

The accompanying sketch of the ground-plan will best explain the interior arrangement of choir and high altar. The choir, separately illustrated, is in itself worthy of close study. The lattice-work is of tumbago, a mixture of gold, silver and copper, imported from Macao. The same metal is used in the railing on both sides of the passage-way leading from the choir to the high altar. There is a tradition that this metal is more valuable than silver and that parties have repeatedly offered to replace all the tumbago used in the cathedral with an equal amount of pure silver for the sake of the tumbago, but, though this tradition is repeated almost daily to American visitors, there is an air of improbability about it. The interior of the choir is arranged with tiers of seats upon three sides. In the centre is a large square revolving-stand, bearing upon its four reclining sides, immense music-books, in which the music of the mass and vesper services are engrossed upon vellum. Each book is a marvel of illumination, and would be a prize to any collector of curios. There is an organ in a carved wooden case upon each side of the choir, extending up to the roof.

The high altar is an error in taste, not only by reason of its position, but also as to its design. It is a glaring anachronism in the first place, having been erected about the middle of the present century, while the walls around it are of the sixteenth and seventeenth centuries. Its design is quite out of harmony with its surroundings and particularly as different colored marbles have been used in it, the columns being of mottled green, not at all in keeping with the sombre tone of the stone columns and arches which support the roof, the bronze color of the tumbago railings and statues, and the age-mellowed tone of the carved-wood lattices of the sacristy. It appears as something foreign to the place in which it exists. It replaced an altar of more suitable design. Some of the figures apparently attached to it are of wood and movable. Stucco, paint and gilding have been made to eke out some of the effects which the architect attempted to produce, and the whole is a sorry medley. Why it should be called the Cypress (*el cipres*) Altar is as yet unexplained. Its position in the church is such as to break the imposing effect of the interior. It shuts off the view of the elegant Kings' Chapel, also of Churrigueresque elaboration and of tumbago. Were both the choir and the high altar removed from their present central position, the effect of the high arches and heavy fluted columns, supporting the vaulted roof, would be very impressive. The floor of plank is another defect of the building. It has probably been laid upon a pavement within the last decade or so. The interior is lighted from the dome and from windows high above the floor. Without looking for them especially, one might visit the cathedral a dozen times without noticing the windows.



"Confessional" in Cathedral, Mexico.

The cathedral suffered somewhat during the great "Reform" period, when all the churches of Mexico had to give up something to the insatiable government. The archbishop removed some handsome paintings, it is said, to his own rooms and still keeps them there. A Murillo is said to exist in the Chapter-House, but I never succeeded in finding it. Some of the frescos are worthy of study: that within the dome, of course, escaping the attention of most visitors, is of "The Assumption." There are two fine paintings in the choir, and the sacristy contains several. Some good paintings by Mexican artists are arranged in the details of the Kings' Chapel or altar.

The church possesses seven chapels besides that of the Kings. One is dedicated to San Felipe de Jesus, a native of Mexico, who was crucified in Japan and has been canonized as a saint and martyr. His chapel contains the sarcophagus of Augustine de Iturbide, Emperor of Mexico just after the Independence. The chapel of the Kings is said to contain the skulls of Hidalgo, Allende, Aldama and Jimenez, early martyrs of the Independence of Mexico.

With all of its architectural defects, the interior of the cathedral is grand and imposing. Visitors are seldom satisfied with a single visit. They return to it again and again, as often as time will allow. It would be impossible for me to state how many times I have visited it, either to watch the services going on (not generally so fine as might be expected in a Roman Catholic country and in so magnificent a cathedral), to listen to the music of the great organs, to watch the motley crowds who resort there to worship, or, more than anything else, to study the lines which go to make up its imposing interior.

ARTHUR HOWARD NOLL.

[1] Explanation of Plan of Cathedral of Mexico: —
A. High Altar; *B.* Choir; *C.* Kings' Chapel; *D.* Chapel of S. Felipe; *E.* Sagrario; *F.* Sacristy; *G.* Archicofradia; *H.* Chapter-House; *J.* Chapels; *K.* Altars.

ANCIENT AND MODERN LIGHT-HOUSES.[1]—XVI.

RED SAND LIGHT-HOUSE.—(*Continued.*)

From Tournoi Belgium

THE following March (1882) Herr Hanks asked the Harkoort Company if they would make a trial to erect a light-house at this locality, and this company, in June, submitted a bid in accordance with their original project. The contract was signed on September 21. The total price for the complete structure, ready for occupancy, but exclusive of the lens and illuminating apparatus, amounted to $213,500, which was later increased by $3,250 on account of alterations made in the height and construction of the upper part of the tower.

The mistakes and errors of omission made at the first trial were of great value to the Harkoort Company—the general plan remained the same and it only remained to execute the details in the proper manner to ensure success.

While the contract was under discussion all the necessary drawings for the details of the caisson and of the special apparatus were prepared, so the work was commenced immediately after the signing of the contract.

The structure consisted, generally speaking, of two parts—the foundation and the tower. The first, of course, was the only part which offered any engineering difficulties.

To build this foundation a caisson was used which, after being sunk to the required depth, was to be filled with masonry and concrete, on which the tower could be erected. The caisson, in plan, resembled a section of a bi-convex lens. It was thirty-six feet eight inches wide, forty-six feet eight inches long, and sixty-one feet eight inches high when it was towed to the site; this height was gradually increased during the sinking to one hundred and seven feet six inches.

The caisson was made of boiler iron four-tenths inches in thickness, was well braced vertically and horizontally, and none but the best material was employed in its construction. It was calculated to withstand a hydrostatic pressure produced by a column of water twenty feet high.

Eight feet four inches above the cutting edge of the caisson was an iron diaphragm, forming the top of the working-chamber, carried by two longitudinal and twelve cross girders. This was also very strongly braced to the walls by a great number of iron brackets. From its centre rose the cylindrical air-shaft, three feet four inches in diameter, provided with an air-lock.

This air-lock had four chambers—two for the use of the men and two for the supply and discharge of material, and was provided with a steam winch for hoisting the sand. Besides, there were six pipes to be used for blowing out the sand if it were found practical to use this more expeditious method.

The upper part of the caisson was divided into four stories. The first, or lowest, was for mixing concrete; the next was the machinery floor, and carried two boilers, one air-compressor, a surface condenser, a centrifugal pump, the coal, and fresh water, and the steam-pipes leading to the two steam hoisting-cranes, to the compressor, and to the winch of the air-lock.

On the third floor were two sleeping-rooms and store-rooms; from this floor access was gained to the air-lock. The top story carried two revolving steam cranes.

As the work progressed the upper three floors would have to be raised from time to time, and it was important that this should be done without interfering with the other work.

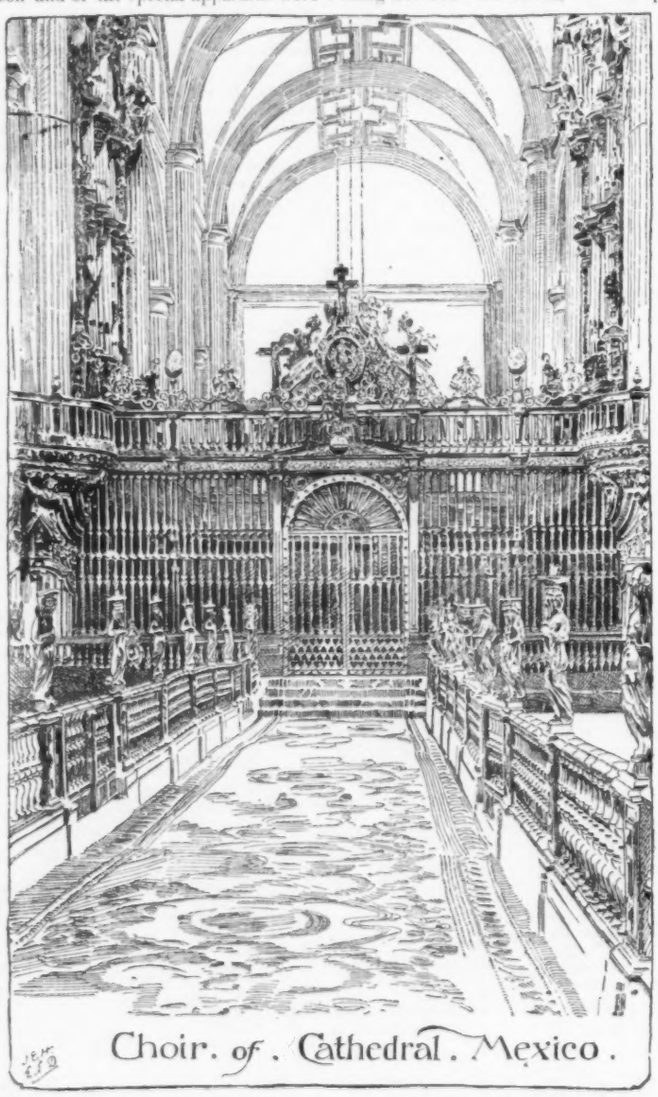
This was accomplished by suspending the two upper floors by four long and strong screws to the vertical ribs of the caisson, which were made higher for this purpose. The second floor was suspended from the fourth by four other screws, and there was another screw in the centre of the fourth floor for raising the air-lock.

By means of these nine screws, all worked from the top floor, the raising of the floors, with everything on them, was effected by a few men without delay to the work.

This was a far superior arrangement to that previously adopted, which required the cessation of all work while the platform was being raised, and in addition, the interior wooden bracing of the caisson was always much in the way.

When the caisson reached the Red Sand Shoal it was to be sunk to a depth of about seventy-three feet below mean low water, and then filled with concrete and masonry to six and two-thirds feet above the same level.

This foundation was to support a tower with a circular base of thirty-four and two-thirds feet, the offset round the foot of the tower being covered with strong cast-iron plates securely fastened to the foundation. To a height of twenty-six and two-thirds feet above the foundation the tower is trumpet-shaped. At this height its diameter is reduced to twenty-three and one-third feet, and this part is solid masonry except the spaces left for cisterns and for the float of the tide-guage.



Choir. of. Cathedral. Mexico.

The portion above the cellar was to be lined with a twenty-one inch brick wall, and have a fireproof ceiling of corrugated iron and concrete.

The upper stories were to have an iron shell with a double wooden lining, lathed and plastered.

Above the living-room is an iron gallery eighty-one and two-thirds feet above low water, and at this height the tower is reduced in diameter to seventeen feet.

Two of the three semi-circular dormers, or small towers, at the gallery level contain range lights, and the third is used as a watch-room. One also contains the stairway leading to the gallery and lantern of the main light. The latter is eleven feet in diameter, and is covered by a copper roof on which is the ventilator one hundred and two and two-thirds feet above low water.

The following is the method employed in transporting the caisson to the site:

The depth of water in the harbor and on the shoals, over which the caisson was to pass on its way to the site permitted a draft of only twenty-three and one-third feet, and in calculating the stability of the caisson the probability of encountering a moderate storm was taken into account.

It was assumed that the caisson would be safe and not capsize when subjected to a wind pressure of about two hundred pounds to the square yard—corresponding to a wind velocity of one hundred feet per second. The caisson was to carry all the machinery previously mentioned, which was to be so arranged that work could be commenced as soon as the caisson was sunk on the shoal, and at the same time it was to be placed as low as possible so as to lower the centre of gravity of the floating mass.

To accomplish this the bulkheads on which the machinery floor rested were provided with four hinged rectangular frames which, when raised vertically, supported the floor in a position ten feet higher.

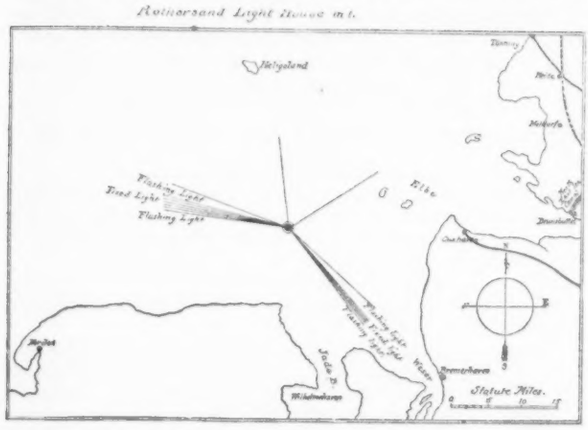
[1] Continued from page 144, No. 613.

It was also important to build the iron shell as high as possible so that after the caisson was sunk it would project sufficiently above the water to prevent the entrance of the sea. Owing, however, to its great weight, this height did not exceed sixty-two and one-half feet, four and one-sixth feet higher than at the first trial.

Sufficient ballast was added to bring the draft to twenty-three and one-third feet, but a careful calculation showed that the stability, with reference to the assumed wind-pressure, was not sufficient. The elongated shape of the caisson required more support at the sides, and to attain this two pontoons were used. They were made of boiler-iron, air-tight, twenty-six and two-thirds feet long, six and two-thirds feet wide, and ten feet high, and had strong lugs fitting into concavities in the shell. Each was provided with a pump for admitting water and with an air-cock, which were so arranged as to be operated from the caisson.

When the latter floated at twenty-three and one-third feet draft the pontoons sunk three and two-thirds feet into the water. When the caisson rolled one pontoon sunk deeper than the other, counteracting the tendency of the structure to leave a vertical position.

It will be seen from the preceding that the most important part of



the execution of the work was the construction of the caisson with all the requisites for transportation, sinking by the pneumatic process, etc.

The contract with the Government was signed in October, 1882, and on the 1st of April, 1883, the caisson was completed as described, and moored at Kaiserhaven ready for transportation.

In the meantime, the necessary vessels and steamers required had been chartered; they consisted of the "*Palme*," on which the men were to be quartered, and which was to be moored near the work. The "*Solide*," a tug which was to tow all vessels to Bremerhaven, in case the weather compelled them to make a harbor. Two solidly built sail-boats, the "*Leopoldine*" and "*Maria*," carried the men between the "*Palme*" and the structure. In addition several vessels and the tug "*Otto*" were employed for carrying material, and kept a constant communication between Bremerhaven and the site.

For the transportation of the caisson to the site, the "*Samson*" and the "*Nord See*," the two strongest tugs of the North German Lloyd were chartered, and in addition the tugs "*Solide*," "*Herkules*" and "*Otto*," were to assist if required. Three special tow lines, 4 8-10 inches in diameter, were constructed for the purpose; two were attached to the stem and one to the stern of the structure, about eleven feet below the surface of the water.

The meteorological station at Hamburg had kindly promised to telegraph daily the weather indications during April and May, and the state of the wind at Waugeroog and Neuwerk, two stations in the neighborhood of the shoal. The weather in April was so unfavorable that the station at Hamburg advised not to start until May 14; this delay was very expensive to the contractors, as they had all the vessels and eighty men under pay during this time.

On the 15th of May good weather was prophesied, but the flood-tide did not rise high enough to float the structure out of the harbor, and then the weather became bad again.

Finally, on the 25th of May favorable news was received from Hamburg, and everything was got ready to start at 2.30 A. M. on the 26th. At 3.30 A. M. the tide had risen high enough to open the gates of the basin, and soon after the caisson, which nearly touched the sills and jambs of the gates, was towed into the Weser. Immediately afterwards the German flag was hoisted on the colossus. The tug "*Nord See*" was ready to take the hawser, and though it was difficult to overhaul the latter on account of its great weight and stiffness, this was quickly done. Then the "*Samson*" fastened its hawser to the "*Nord See*," and both headed for the site. The other steamers and sailing vessels, nine in all, accompanied the tow, making quite a fine naval pageant. The contractors' steamer headed the procession, indicating the deepest channel, and thus all shoals were passed in safety. Quietly and majestically the caisson floated down the Weser with the ebb-current, and so quickly that it arrived at Droorgat at 7.15 A. M. The strength of the ebb had greatly diminished, and as it was impossible to reach the site before the tide changed, the caisson was anchored near the Eversand shoal to wait for the next high water at 4 P. M.

The flood-current increased so much by 11 A. M. that the anchors of both tugs commenced to drag. Their engines were quickly started and the "*Solide*" was called to their assistance, but as all three could not prevent the caisson from drifting, the "*Herkules*" was also called upon. The combined strength of these four steamers, about 350 horse-power, held the caisson and when the flood diminished they were enabled to proceed, so that at 2.30 P. M. the caisson reached the Hohewey Light-house and came to anchor again. Hardly had it arrived when a signal from the Light-house announced the arrival of a telegram from Hamburg, stating that the wind would change to north, and that squalls were approaching from England. In a short time clouds commenced to rise, the sky turned the color of sulphur, the sea got rough, rain and wind followed, and at 4.50 P. M. the fleet was in the centre of a storm, which caused great anxiety. However, the caisson stood the storm remarkably well, rolling very little as the pontons gave it excellent support.

This storm prevented the continuance of the journey, the watch on the caisson, twelve men, were relieved by others, and by 8 P. M. the whole fleet was got ready for the night.

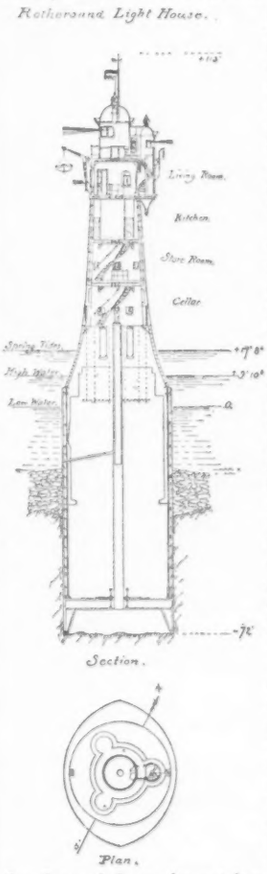
The delay was troublesome, as at every change of the tide the caisson swung round and had to be guided by the tugs, this manœuvre was difficult to execute in the darkness, but was successfully accomplished.

The following day the weather was bad, and the start was postponed until the succeeding one at 7.30, A. M. when the anchors were weighed and the seaward journey re-commenced. When, as the report has it, "in spite of the rough sea, the colossus parted the water with ease, wind and water did not affect his majestic dignity."

At 9 A. M. the Bremen Light-ship was passed, at 9.30 the dangerous "Rothen Grund," and at 10 the tow arrived at the place where a wreck buoy located the position of the former ill-fated caisson.

A little over twelve hundred yards below where this caisson was wrecked a buoy, painted black, white and red marked the spot where the tower was to be erected.

The Harbor-Master and the Chief-Engineer boarded the caisson; slowly and carefully the tugs brought the structure nearer and nearer, and when about one hundred yards distant from the buoy — exactly at eleven o'clock — the raising of the flag on the caisson gave the signal for all anchors to be dropped overboard. Both valves for admitting water to the caisson were opened, and the latter slowly and steadily, and perfectly plumb, sank to the bottom of the sea. A slight shock, at 11:15, indicated that it landed on the shoal. A second time the flag was raised and was greeted with loud cheers by all who witnessed the performance.



The heavy hawsers were removed, and the large tugs left the site and returned to Bremen. The most pressing work was now to release the pontons which were invisible, being about two yards below the surface of the water. By opening the valves sufficient water was admitted into the pontoons to overcome their buoyancy, they then began to sink, thereby disengaging themselves from the caisson. As soon as they were free the valves were closed again and both pontoons were sunk in the neighborhood where they soon after disappeared in the sand of the shoal. The increased current which was produced in the vicinity of the caisson at once scoured the shoal to a depth of three feet near by, diminishing to nothing at a distance of one hundred yards.

In addition, the first flood-current scoured a hole alongside of the caisson facing the current, inclining the caisson toward the north four degrees; during the following ebb-current the south side was undermined, and the caisson inclined the same amount to the south. In this manner, moving like a pendulum, the caisson sunk itself in four days more than six feet in the shoal. On the first of June the cutting edge was thirty-five feet below low water and the ceiling of the working-chamber commenced to bear upon the surface of the shoal. This self-sinking finally ceased entirely at thirty-seven feet below low water, when the large number of brush mattresses which had been sunk on the shoal prevented further scour.

The remainder of the working season was devoted to sinking the

caisson by the pneumatic process, to filling it with concrete and masonry, to placing additional mattresses and rip-rap around it, and to building the iron shell as high as possible. On October 15, 1883, the cutting edge was fifty-two feet below low water, the concrete level was thirty-six-and-two-thirds feet above low water, the top of the masonry was eight-and-two-thirds feet above low water, the upper edge of the highest completed section of the iron caisson, and also the height of the floor of the quarters for the temporary keepers was thirty-seven-and-one-quarter feet above low water, and finally the uppermost floor with the steam cranes, and also the upper edge of the unfinished section of the caisson was forty-seven-and-one quarter feet above low water, or ninety-nine-and-one-quarter feet above the cutting edge. On this day the workmen were compelled to leave the station as the strong southeast wind made it impossible to go near the caisson. The vessels anchored at the Eversand shoal to wait for better weather, but on October 16th the weather became worse, and the wind and sea increasing in violence, they returned to Bremerhaven. On the 17th and 18th of October, 1883, it was storming as it did on October 13, 1881, when the first caisson was destroyed. This time, however, but little damage was done. According to the reports of the two temporary keepers, stationed on the structure, a single wave, on the 18th of October, tore asunder one of the plates of the top section of the caisson and bent up two others which had not been bolted together, and were consequently liable to such destruction. Two heavy boxes of bolts were blown from the upper floor, the caging around one of the steam cranes was greatly damaged, and one of the keepers was violently thrown by a wave to the floor of his room as he attempted to leave it.

After this storm, which was followed by others of equal violence, but little work could be done during the winter. The air-lock and the machinery floor were raised so that the latter stood at a level twenty feet above low water. The masonry and concrete were also raised twenty and forty inches respectively, and a Pintsch gas apparatus with lantern and light visible six to seven nautical miles was erected.

Work was commenced in February, 1884, and continued until November, with many interruptions from wind and weather. The required depth, seventy-three feet below low water, to which the caisson was to be sunk, was attained on the 21st of May, 1884, one year after the caisson was launched at the site, and at the same time the level of the concrete and masonry had reached a height of three feet four inches above low water. Over two thousand cubic yards of sand, in addition to that which had leaked into the working-chamber from without, was all removed from the latter by the sand blast. The sand was very fine and mixed with small shells. A layer of stones was reached when near the required depth, but as it was not necessary to remove them; no use was made of the steam crane in the air-lock.

In June the machinery and boilers were removed, and by November the solid substructure of the tower, the cellar, the storerooms and kitchen were completed, and a part of the exterior walls of the living-room was put up.

Good progress was also made in securing the sand around the foundation. According to contract, the latter was to be covered with brush mattresses thirty inches thick and over a width of fifty feet around the tower, held down by a layer of rip-rap twenty inches thick, first filling all depressions caused by the scour during the construction of the foundation. This scour was much greater than had been anticipated.

This work was accomplished with great difficulty, and it was not until the middle of the following year that it was completed: sixty-six hundred cubic yards of mattresses and eight hundred cubic yards of stone were needed.

On December 2, 1884, Herr Kröte, who represented the Government during the construction of the tower, wished to inspect it once more prior to a pleasure trip during the Christmas holidays, and left in company with the Constructing Engineer to stay but a short time. They had hardly made a landing when a storm arose which made it impossible to take off the inspecting party. At first they rather enjoyed their detention, but when days lengthened into weeks and there was still no possibility of release, the situation became grave, especially as they signalled that one of the men was seriously ill. Finally, on December 21, with the sea still running high, all were successfully taken off except two men who were left to act as keepers during the winter.

Work was recommenced on April 12, 1885, the living-room and its three dormers, the lantern and the interior finish completed by August 10th and the main lens set up.

The main light of the fourth order, with Otter's revolving shutters, guides the incoming vessel first to the tower, and from there into the narrow channel leading to the Hoheweg Light-house. Each of these courses is marked by a fixed light, illuminating an arc of seven degrees toward the sea, and an arc of three-and-one-half degrees toward the river (see chart). In passing the limit to either side of these courses the fixed main light changes to a flashing light. The distance from the tower, where a vessel approaching the light has to change its course, is indicated by two fifth-order lights, one in the northwest, the other in the south dormer, about seventeen feet below the main light. The intensity is so regulated that they only appear to the naked eye as separate lights at a distance of two-and-one-half nautical miles from the tower; at a greater distance they cannot be distinguished as they are overpowered by the main light. Finally, another light of the fifth order was placed in the dormer containing the stairs, to locate the range on which vessels, coming from the Island of Heligoland, enter the mouth of the Weser.

The base of the structure, for a height of twenty-seven feet, is painted black, and the tower above, with alternate red and white bands fourteen feet wide. This makes the tower so conspicuous that it can be seen on a clear day for a distance of twelve nautical miles.

By the end of August the upper part of the caisson was taken down; in September the tower was connected to the shore by an electric cable, and on October 23, 1885, the tower was accepted by the Government.

This is, I believe, the first light-house erected at a long distance from land which does not rest on a rock foundation.

[To be continued.]

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSES ON WALNUT STREET, BROOKLINE, MASS. MR. H. I. COBB, ARCHITECT, CHICAGO, ILL.

[Gelatine Print, issued only with the Imperial Edition.]

TWELVE COMPETITIVE DESIGNS FOR THE FACADE OF MILAN CATHEDRAL.

[Issued only with the Imperial Edition.]

THESE prints are reproduced from the special edition of *L' Illustrazione Italiana* of September 11 which gives a full and thoroughly illustrated description of the competition and of the cathedral itself.

OLD COLONIAL WORK IN THE SOUTH, NO. II. — GADSBY TAVERN, MEASURED AND DRAWN BY MR. GLENN BROWN, ARCHITECT, WASHINGTON, D. C.

A Mahogany Candlestick.

A Lesser Light of Washington Lodge used at the Funeral of George Washington.

IN this building are found many items of interest both from an architectural and a historical standpoint. It was erected in 1793 when Alexandria was a flourishing town, probably one of the most prosperous in the country. It was built by John Wise, a noted tavern keeper in those days. The announcement of the opening of this hotel may still be seen in a *Virginia Gazette* of 1793.[1] Here the most prominent people of the day were feasted and féted. In 1796 a banquet was given there by the Alexandria Washington Lodge of Masons. It was also a favorite place for assemblies, or balls, as we should call them now. A book called "*The Lodge of Washington*" tells us that at a ball given at the Gadsby Tavern on the 22d of February, 1798, Washington participated by his presence in celebrating his own birthday. A portion of the musician's gallery in this ball-room is shown in the plate. This gallery is not supported by posts from the floor where they would interfere with the dancers, but is hung from the ceiling.

Alexandria was probably the first place to celebrate Washington's birthday. The ceremonies usually consisted of a parade by the military and a birthnight ball. Assemblies were given regularly by the Washington Society of Alexandria, "attended by the beauty and fashion of the town." The following autograph letter is still preserved in the Lodge rooms:

MOUNT VERNON, 12 Nov., 1799.

Gentlemen:

Mrs. Washington and I have been honored with your polite invitation to the Assemblies in Alexandria this winter, thank you for this mark of your attention. But alas! our dancing days are no more. We wish, however, all those who relish so agreeable and innocent an amusement all the pleasure the season will afford them.

Your most obedient and obliged humble servant

GO. WASHINGTON.

GEO. DENEALE
WILLIAM NEWTON
ROBERT YOUNG
CHAS. ALEXANDER
JAMES H. HOOE
} *Managers.*

The rooms where the Alexandria Assemblies held their meetings are now a part of what is known as the City Hotel, and they were built some years before the portion known as Gadsby's Tavern, probably about 1780. The interior doorway on the plate is taken from this portion of the building.

[1] Advertisement from the *Virginia Gazette* and *Commercial Advertiser*.

"City Tavern.

"Sign of the Bunch of Grapes.

"The Subscriber informs his customers * * * that he has removed * * * to his new and elegant three-story brick house * * * which was built for a tavern and has twenty commodious and well-furnished rooms in it, where he has laid in a large stock of good old liquors and hopes he will be able to give satisfaction to all who will favor him with their custom JOHN WISE.

"ALEXANDRIA, VA., February 6, 1793."

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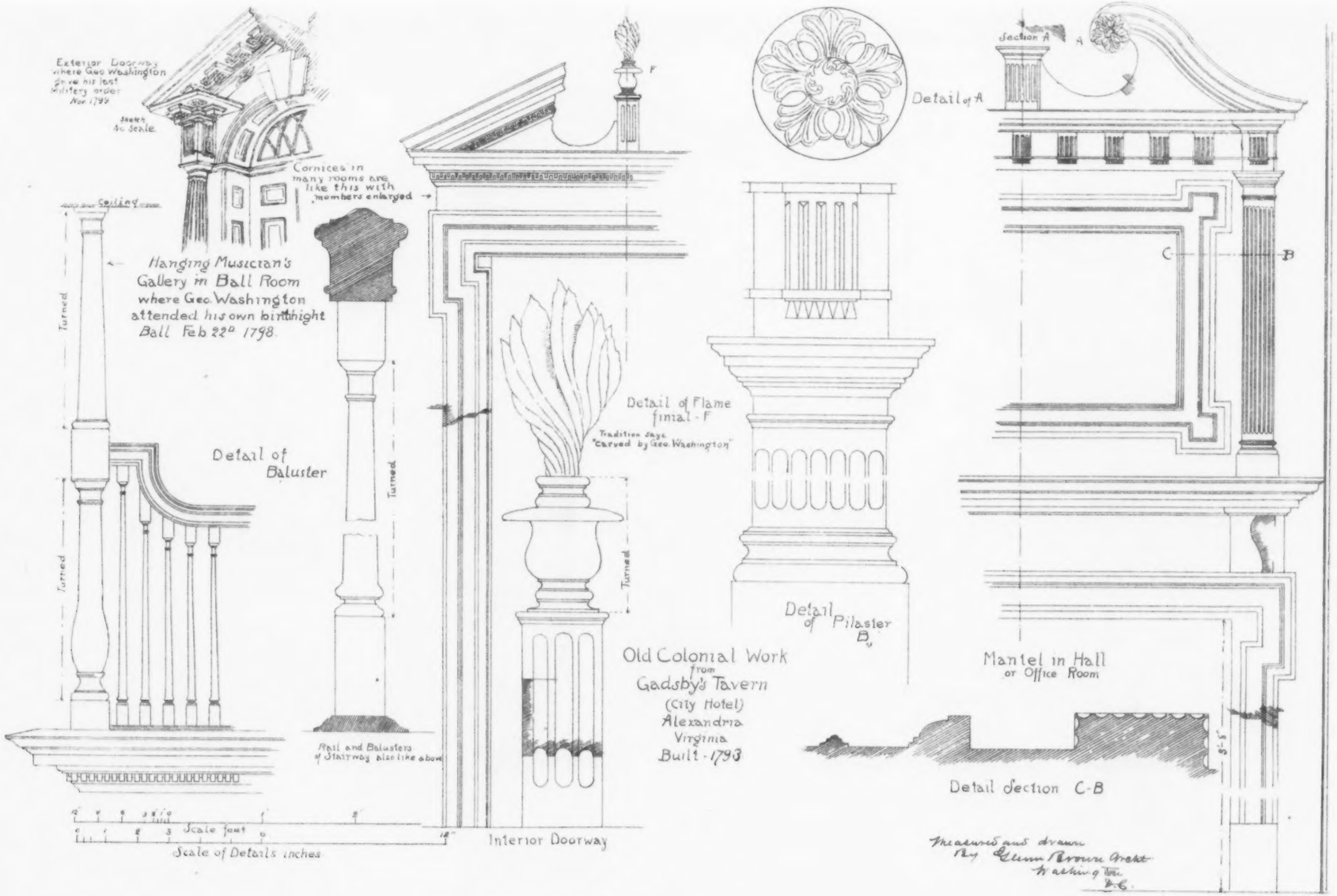
Exterior Doorway where Geo Washington gave his last Military order Nov 1799
Sketch No Scale
Cornices in many rooms are like this with members enlarged
Hanging Musician's Gallery in Ball Room where Geo. Washington attended his own birthnight Ball Feb 22d 1798
Detail of Baluster
Turned
Rail and Balusters of Stairway also like above
Detail of Flame finial - F
Tradition says "Carved by Geo. Washington"
Old Colonial Work from Gadsby's Tavern (City Hotel) Alexandria Virginia Built - 1793
Detail of Pilaster B
Detail of A
Section A
Mantel in Hall or Office Room
Detail Section C-B
Scale feet
Scale of Details inches
Interior Doorway
Measured and drawn by Glenn Brown Architects Washington D.C.

Heliotype Printing Co. Boston.

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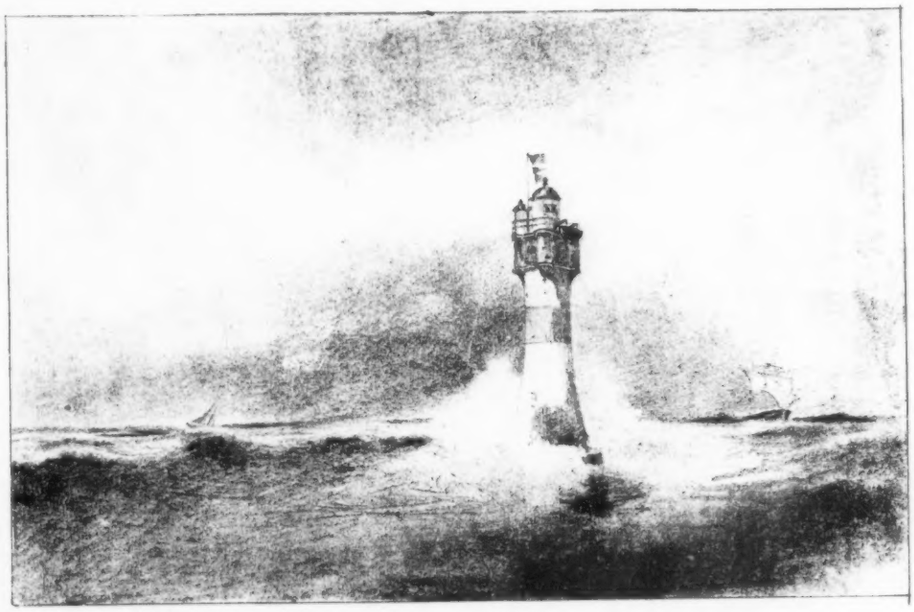

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The Rotherwand Lighthouse

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Sagrario Metropolitano or Parish Church of Mexico

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High Altar called the Cyprew. Cathedral City of Mexico

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Heliotype Printing Co. Boston.

THE HOTEL HOLLENDEN

CLEVELAND, OHIO.

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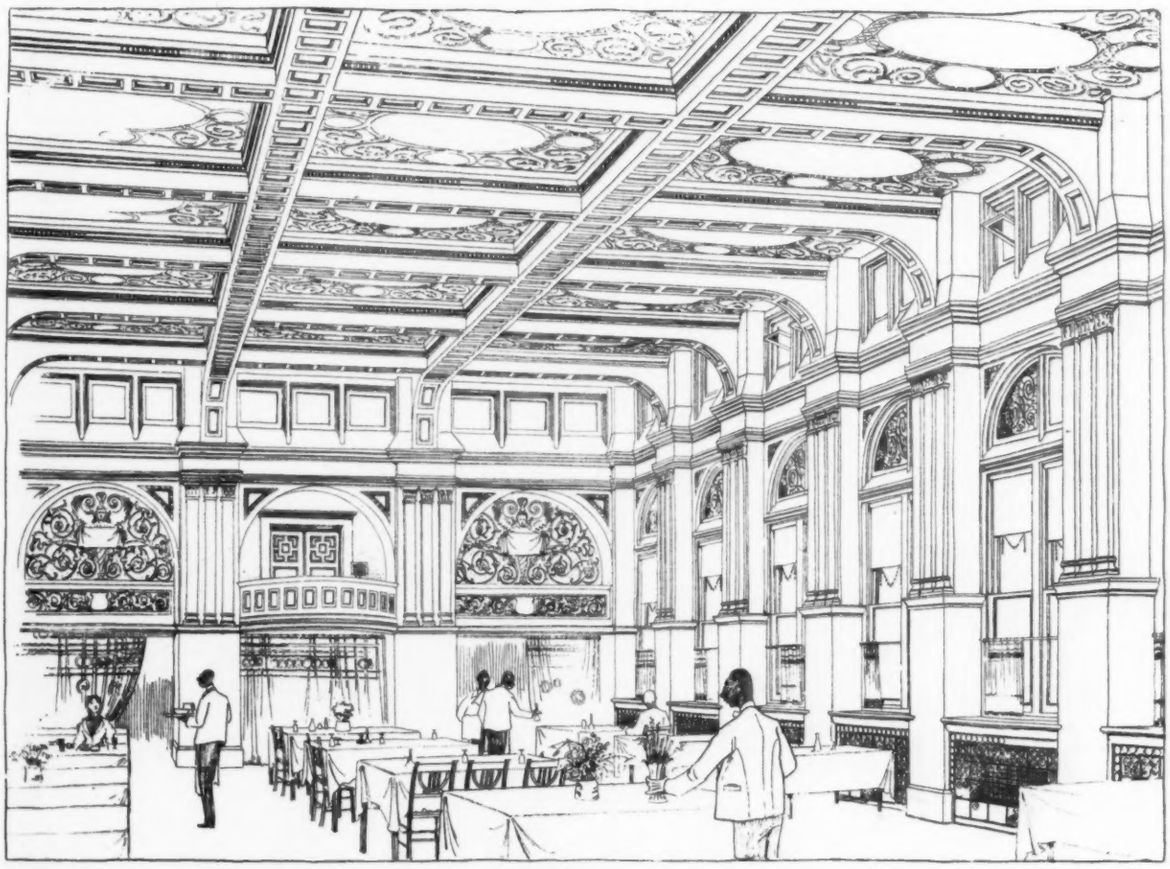
THE OFFICE —— THE DINING ROOM

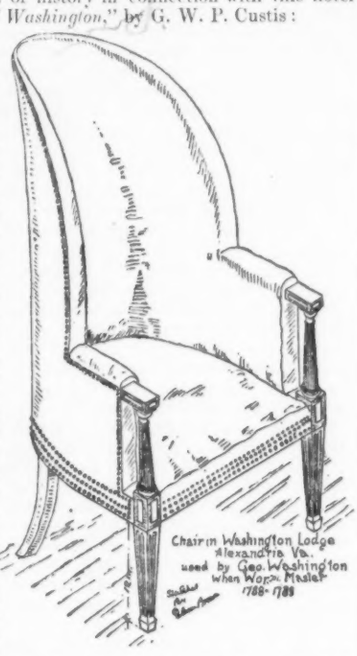


Heliotype Printing Co. Boston.

HOTEL HOLLENDEN, CLEVELAND, O.

GEORGE F HAMMOND ARCHITECT

I quote the following bit of history in connection with this hotel from the "*Recollections of Washington*," by G. W. P. Custis:



"It was in November of the last days, that the General visited Alexandria upon business and dined with a few friends at the City Hotel, Gadsby, the most accomplished of hosts, requested the General's orders for dinner, promising that there was a good store of canvas-back ducks in the larder. 'Very good, Sir' replied the chief 'give us some of them with a chafing-dish, some hominy, and a bottle of good madeira, and we shall not complain.'

"No sooner was it known in town that the General would stay to dinner than the cry was for the parade of a new company called the Independent Blues, commanded by Captain Piercy, an officer of the Revolution. The merchant closed his books, the mechanic laid by his tools, the drum and fife went merrily round, and in the least possible time the Blues had fallen into their ranks and were in full march for headquarters.

"Meanwhile the General had dined and given his only toast 'All our friends' and finished his last glass of wine, when an officer of the Blues was introduced who requested, in the name of Captain Piercy, that the Commander-in-chief would do the Blues the honor to witness a parade of the corps. The General consented and repaired to the door of the hotel looking toward the public square, accompanied by Colonel Fitzgerald, Dr. Craik, and Mr. Herbert, and several other gentlemen. [This doorway was removed a few years ago from its original position and put up at a back entrance. See plate.] The troop went through many evolutions with great spirit and concluded by firing several volleys. When the parade was ended the General ordered the author of these recollections to go to Captain Piercy and express to him the gratification which he, the General, experienced in the very correct and soldierly evolutions, marchings, and firings of the Independent Blues. Such commendation from such a source, it may well be supposed was received with no small delight by the young soldiers who marched off in fine spirits, and were soon afterwards dismissed. This was the last military order issued in person by the father of his country." The next historical event of interest connected with this house was the banquet to Lafayette by the citizens of Alexandria on his visit to this country in October, 1824. On his visit he brought his son, Geo. Washington Lafayette, with him. He was met by a long procession of citizens, old soldiers carrying old artillery and relics of Washington and the Revolution, all fully described in the *Alexandria Gazette* of Oct. 19th, 1824. Robert E. Lee, then a boy, was a marshal in this procession. The hotel's name was changed for the third time, at this date being called Claggett's Tavern, from its host. "About five o'clock the General [Lafayette] attended the public dinner at Claggett's Tavern, at which were present many distinguished gentlemen, among others the Hon. John Quincy Adams, Secretary of State, Commodores Rodgers and Porter, General Macomb, Colonels Peyton and Harvie of the Yorktown Committee, and several others." Among thirty toasts the first was "The memory of our late illustrious neighbor and fellow-citizen, Geo. Washington." On the 21st of February, 1825, the lodge of Washington gave Lafayette a masonic banquet at this hotel. The members present, the songs they sang, the toasts they drank, the speeches they made, are all recorded in the lodge of Washington. Lafayette's toast was, "Greece, let us help each other."

To within the last ten years this building was used as a hotel, under the name of the City Hotel. At present it is used as an auction-house and storage warehouse by R. T. Lucas. I am indebted to the records of Alexandria Washington Lodge No. 22, for many of the facts mentioned as well as the privilege of making the sketches of relics of Washington, which I shall use as initial cuts in this and other articles.

GLENN BROWN.

ROTHERSAND LIGHT-HOUSE. TOWING THE CAISSON.

FOR description see article on "Ancient and Modern Light-houses" elsewhere in this issue.

FRONT OF THE SAGRARIO METROPOLITANO, OR PARISH CHURCH, MEXICO, MEX.

FOR description, see article elsewhere in this article.

THE HIGH ALTAR, CALLED "THE CYPRESS," IN THE CATHEDRAL, MEXICO, MEX.

THE HOTEL HOLLENDEN, CLEVELAND, O. MR. GEORGE F. HAMMOND, ARCHITECT, CLEVELAND, O.

DINING-ROOM AND OFFICE OF THE SAME.

SANTA MARIA DEL FIORE, FLORENCE.

FLORENCE, October 7, 1887.

IT is not too late to speak of the fêtes which took place lately at Florence on the occasion of the unveiling of the façade of Santa Maria del Fiore. It is, you all well know, one of the, if not *the*, finest monuments of the Italian Renaissance. The published accounts of this grand artistic event only contain details of the episodes attending it, and present a purely descriptive picture of the ceremonies and public rejoicings for which the ancient city of the Medici served as theatre. But from the artistic point of view neglect has been shown in bringing into relief some interesting observations. In place of telling over again the story of the Florentine fêtes, which the immense city was hardly large enough to contain, I will stop by preference at reflections likely to be of interest to those who concern themselves with matters of art and their story.

First, I must mention a very local and very Italian phenomenon, or rather very Florentine. I mean the intelligent eagerness and the ardent enthusiasm with which the population of Florence and its environs associated together for this artistic solemnity. The people of this part of the peninsula are certainly more polished and better educated than those of other parts of Italy. The Piedmontese is full of urbanity and obligingness but the spirit of discipline accounts for much in his customs. The Milanese is well instructed and laborious, the Venitian is frivolous and jesting, the Genoese is hardy and enterprising, the Roman is hospitable and witty, the Neapolitan is impassioned and imaginative, the Florentine, however, is lovable and poetic in taste as well as by nature, and seems to have received from the Etruscans, his ancestors, the cultivation and fine manners of the Athenians. We recognize in them that artist race which wished to be free to gather riches and accumulate treasures only in order to consecrate them to the erection of monuments which to-day bear witness to its vanished grandeur. The ancient Republican city has preserved its classical edileship; nothing, or almost nothing, is changed in its magnificent appearance, so much does it still bear the stamp of exquisite grace, which recalls the fairest ages of art. The Place de la Seigneurie, where were discussed matters of interest to the public, and the *parvis* of Santa Maria del Fiore, where, during the hours of leisure, the merchants and bankers who used to lend their sequins to the kings of England were wont to collect and discuss questions of philosophy and æsthetics, have not ceased to be the two converging points to which flow the daily movement of the city. Without change of costumes, there only needs a little imagination to renew, as by enchantment, the scenes of those times when the furor of the factions and the love of art agitated this nation of lettered manufacturers, — when the Florentine people, after having wasted its forces in civil warfare, retired within itself in order to dream under the portico of its magnificent cathedral, just as the Athenians used to rest themselves from their rude labors and intestinal dissensions under the shadow of the Parthenon.

Those who deny the beneficient influence exerted by Catholicism upon the work of the mind ill understand the history of Italy, which has been the cradle of the arts. At Florence, at least, it is certain that if the papacy had been vanquished in the fourteenth and fifteenth centuries, and if the Puritanism of Savonarola had obtained the upper hand, the Renaissance would have been stifled at its birth. We know what a hatred this great man nourished against painting and sculpture, which he considered as accursed, and opposed to the spirit of true religion. If it had rested with him, a colossal *auto da fé* would have been made with all the treasures of Italian genius, which, according to the morose monk, imprinted on Christianity a character of worldliness contrary to its essence; in which the figures of the divinity were represented, according to him, under aspects far too sensual and too humanlike. Michael Angelo, who entertained for the Dominican of St. Mark a filial veneration, and who placed him among the elect in one of his frescoes, "The Universal Judgment," did not imagine that his idol felt only dislike for art.

The triumphant rigor would have arrested the upward movement of Italian genius, renewing its life after a long period of inanition; and when, after the death of Leo X, who had endowed his pontificate with an immortal éclat, there was, on the part of some of the Roman cardinals a movement or reaction against the gentle and elegant costumes introduced into the Court of Rome by the Florentine Popes, extreme rigorism came very near taking its revenge. Chance had brought to the chair of St. Peter a Flemish pope who had, until

then, lived the silent and austere life of the cloister, and who, praying and believing, after the manner of the Christians of the early centuries, had a terror of the unwholesome influence which the sumptuous splendor of the arts could pour out upon the future of Catholicism.

Adrian VI seemed to be highly scandalized by the portions of the Sixtine Chapel painted by Buonarotti, which, he said, looked more like the main room of a public bath than the vault of a church. He covered his face in token of his repulsion at the sight of the Laocoön, and cried out, "*Sunt idola antiquorum.*" This pope had come from too great a distance to appreciate that the ancient city of the Cæsars, besides being the centre of the Catholic world, ought also to rise to the rank of the capital of the arts and sciences and of genius, and that it was by way of paying homage to triumphant religion that it clothed itself with an incomparable splendor. One thing is certain, that is, that the papacy preserved the arts in Italy; and that if the Ghibellines, imbued with the spirit of Savonarola, had gained the victory, the Italian nation would never have known the grand artists of whom it is to-day so justly proud. Across the cruel vicissitudes of its history the Tuscan people were able to preserve the courtesy and distinguished manners which were due to their artistic education. They still preserve a very lively passion for everything which is fair and agreeable.

One should have seen the crowd that hurried from every part of Tuscany to gather about the cathedral on the day of the unveiling of the façade. One would have surmised that it had not been brought together only by motives of commonplace curiosity. The cult of the arts is of such age in this country that little by little it has become endemic, and has spread through all classes of people. It has flashed into the suburbs, so that the most modest farmer and the most humble bourgeois know how to feel the impassioned admiration for a statue or a monument. Every question of art is here a matter of public interest, and the columns of your journal have doubtless related in what fashion the dissension which raged some time ago in the city on the subject of the façade of Santa Maria del Fiore was finally settled.

You have not forgotten that the construction of this church, commenced toward the end of the thirteenth century, after the designs of Arnolfo di Lapo, was interrupted by the death of the architect. Later, Brunelleschi added to it the magnificent dome which crowns so worthily the rear portion; but the façade remained unfinished up to the formation of the kingdom of Italy, although several great artists, amongst others Giotto and Andrea del Sarto, had been charged at different times with filling the void. Immediately on the annexation of Tuscany to Piedmont, the king, Victor-Emmanuel, signed a decree authorizing a competition, and from this time dates the conflict which arose over the style which should be adopted for the completion of this work — a conflict which lasted more than twenty years.

Some maintained that the façade ought to be completed in the tricuspidal style, which finishes the façade with three gables. Others, on the contrary, contended for the basilical style, which is composed in the main only of one low gable, as is seen in most of the Greek and Roman basilicas. It was easy to indefinitely prolong this discussion, for amongst the drawings left by Arnolfo, the one for the façade was not discovered, so that it was not possible to know what was the architect's own idea as to the style in which the unfinished portion of the church should be completed. To put an end to the discords thus provoked, and over which the entire population got itself into a ferment, the Government decided to submit the question to the suffrage of the people. Therefore, there were set before the people *fac-similes* of two façades constructed in these two opposing styles; and the inhabitants pronounced in favor of the basilical style by a solemn vote. Could not one believe these things took place at Athens on seeing the doctrine of the appeal to the popular will thus applied to matters of art? So far as the manner in which was settled the architectural problem which had remained in suspense since the death of Arnolfo di Lapo, there ought, perhaps, to be formulated some reservations, and we ought to wait until the first impression has faded away before forming a judgment in cold blood. In my opinion much haste has been shown in proclaiming throughout Italy that the work executed at Florence by the architect De Fabris, the winner of the royal competition, is the architectural *chef d'œuvre* of this century, which has transformed Santa Maria del Fiore into the most beautiful monument in the world.

So far as execution goes, the new façade leaves nothing to be desired. The marble of which it is built is hewn, cut and chiselled with an incomparable ability, and the colors are arranged with irreproachable good taste. Certain of the details are executed with a delicacy and precision which are astonishing. Amongst the statues which ornament pilasters or which crown pinnacles there are some of striking beauty, and one may say that all the ornamental parts have been treated in a most masterly way. The mosaics which ornament the tympana of the three arches are most happy in their reserve, and indicate a definite renaissance of the mosaicist's art, which our ignorance of the methods employed by the Greeks, our masters in this art, had allowed to fall into desuetude for a long time past. To-day, thanks to the precious discoveries of Sig. Salviati, we can reproduce in mosaic the most complicated pictures, can render all the contrasts of chiaroscuro and all the delicacies of drawing, and expose the work to the air and sunlight for ages without fear that they shall ever undergo any alteration.

The sentiment of admiration which the new façade inspires, considered as a piece of modern work, apart from the edifice which it was designed to complete, can warrant only few criticisms, if one were disposed to make them. I would only criticise, if I dared, some few bits of relief placed here and there to soften the asperities of the design, and notably one figure of Christ, reclining with crossed arms upon a plate arranged obliquely at the top of a tabernacle, in such fashion that the image of the Saviour, presented in this attitude in the middle of a disc, awakens vaguely the suggestion of a spitted human pigeon. It is grotesque and unpleasant, and this *bizarre* manner of exhibiting the son of Mary, who is enthroned, queen-like, in the centre of the façade, shocks the spectator, and casts a discordant note into this marble poem where everything ought to contribute to the glorification of the religious sentiment which hovers about the building. In any event, in order to judge impartially of the character and value of Sig. De Fabris's design, one must resolutely lay aside the pleasing impressions which are produced by the brilliancy of the marbles, the skilful minglings of shadows, the luxury of ornament, the profusion of the statues, and the effulgent splendor which bursts from this vast work of architecture, which, all glorious, has just left the hands of the sculptors. There are about it seductive elements against which one must be forewarned. When at length one has succeeded in getting on his guard against this deceitful though very natural impression, one feels that the façade of Santa Maria del Fiore has, before everything, the grave fault of not being conceived in any definite style, and of being rather the result of a compromise between opposing tendencies. Sig. De Fabris had first conceived his design in the tricuspidal spirit which belongs to the Italian Gothic, and of which the Cathedrals of Siena and Orvieto offer the most perfect models, for his design had been brought into shape before the *plébiscite* of which I have just spoken. Death overtook him during the progress of the work, and then his adversaries took their revenge and succeeded in obtaining sanction for the style which he had repudiated; so that the façade, which had been commenced in a style dear to the dead architect, was finished in that to which he was opposed. This strikes the eye at once, for the façade is tricuspidal at the base and basilical at the summit. The lower portion shows three arched doorways surmounted each by a tabernacle, the repetition of which at three different points marks an advance towards the tricuspidal style. Then all at once, as the eye is raised it meets abruptly the crowning line cut horizontally across, scarcely interrupted at the centre by the low gable, as was required by the law of the basilical school.

I am equally of the opinion that in its relations with the other portions of the building, the new façade is not beyond criticism. Arnolfo di Lapo, the architect of the Florentine basilica, knew how to fuse and appropriate for his own uses all the styles known at his time in Italy — Gothic, Greek, Arab, Byzantine, Moresque — and from this mixture he extracted a style of great individuality, which, without being composite, united all the graces, all the beauties and all the special features of the rest, although imitating no one of them.

The temple erected by Arnolfo is remarkable in the history of Italian architecture because of this; for one sees in it everywhere the effort of a genius which seeks to free itself from every foreign yoke, and aspires to create a style in which it can exercise its own temperament untrammelled. From the moment the question of completing the building came up, it was necessary to seek as much as possible the fundamental in piration which had presided over its birth. Brunelleschi had not been wanting in this particular, and his dome, which yields to that of St. Peter only in the amplitude of its proportions, worthily crowns the rear portions of the monument, and is in perfect harmony with the general physiognomy of the building. Giotto, on the contrary, who constructed the square tower, planted at one side of the building facing the baptistery, in it created a cruel subject of embarrassment for whoever later should have to build the façade. This tower, of a heavy Gothic style, parades itself with a brutal indiscretion and by the discordance which exists between its massive breadth and the knowing and lightsome elegance of the nave of Arnolfo di Lapo, it seems a defiance launched at posterity by this great artist, who was in painting a precursor as revolutionary as Donatello was in sculpture.

The architect called upon to finish Santa Maria del Fiore was perforce condemned to struggle against two alternatives equally distressing, for he could not bring his work into accord with the campanile of Giotto without its swearing at the rest of the building, nor yet bring it into harmony with the general character of the Cathedral without finding itself in discord with the tower of Giotto. Only an architect of great genius could extricate himself from such an embarrassment by doing as Giotto did, that is to say, by giving free career to his imagination without occupying himself too much with his surroundings.

Sig. De Fabris was certainly endowed with a superior talent, but he lacked the boldness by right of which his talent could have been transformed into veritable genius. After struggling for a long time against these two alternatives which I have just mentioned, he finished by yielding, and allowed himself to be completely subjugated by the overpowering impression of the campanile of Giotto. His pencil glided in the direction of the style which characterizes this campanile, and his façade most unfortunately smacks of it.

It is, moreover, too heavy and too massive, and it accentuates in Gothic spirit the general physiognomy of the building which Arnolfo di Lapo endeavored to render as little Gothic as possible. It forms

thus a disavowal, a repudiation, an antagonism at which the spirit of Arnolfo di Lapo has just right to be offended. Once granted that every monument is an immortal book for whoever knows how to read between its lines, Sig. De Fabris has committed the same fault with which a writer could be accused who, being charged with writing the last lines of a very beautiful chapter of a volume, should apply himself to the task of making in this chapter a refutation of all the tendencies and sentiments which the author had developed in the preceding chapters.

Many of your readers, without doubt, will have the opportunity of verifying these observations. Italy is an obligatory stage for every traveller from the New World who comes to Europe, and of all the monuments which Italy possesses, Santa Maria del Fiore is perhaps the most interesting for all who wish to discover the beginnings of Italian architecture. I hope that those who may study this monument after having read this article, will recognize the justice and the impartiality of judgment which it expresses. H. MEREU.

THE TRAINING OF AN ARCHITECT.[1] — I.

AN architect ought to be familiar with *buildings and structure*. He ought to know all sorts of buildings, their various purposes, and how those purposes are provided for — all that makes them suitable and unsuitable for use, and for any emergencies for which they ought to be prepared. He ought to know structure also — that is to say, all the materials of which buildings are usually made, their appearance, qualities, defects — the marks of goodness or badness in them and the modes in which they are wrought, the work they will have to do in the structure, and their fitness for it. He ought to understood the sites and surroundings of buildings — drainage and sanitation fittings and appliances, and should have mastered the scientific principles upon which such things as heating, ventilation, lightning-conductors, and cooking-apparatus should be arranged, as well as their practical details. He has to understand the decay and disruption of buildings, and the risks of decay and accident that beset them, and how to guard against such risks. Again, an architect ought to know something about the history of buildings, and the most important structures in the world. He ought to know the artistic principles upon which good buildings have been designed, and the forms, mouldings, enrichments and features which have been to the great artists in architecture what the colors on his palette are to the painter. And he ought to know by personal knowledge and experience, by measuring and drawing out in some cases, and by sketching and noting in others, a considerable amount of good architecture and good ornament, some of which ought to be from other countries than our own. And with some of this architecture he ought to be familiarly, nay, intimately acquainted. Further, he requires to be at home upon buildings in course of construction, to foresee what is likely to be successful or otherwise, whether in arrangement, construction, or design; and to be able to correct defects and prevent mistakes, alike of design and of construction before it is too late.

Again, the architect is required to know *men and affairs* as well as building. You will come to find, as you advance in life, that in every professional calling, as, indeed in every important position in life, a knowledge of men is the most valuable of all acquisitions. Even the solitary student, or the lonely landscape-painter, works for others, and if he succeeds it is either because his mind is so in harmony with the thoughts of his time that he involuntarily produces what others delight in, or else because his powers of calculation and observation enable him to take the measure, so to speak, of the men of his generation, and cleverly to produce (possibly without sympathy) some work sufficiently in harmony with the time to please them. Far more is it the case with ourselves whose work is from first to last done in contact with our fellow creatures, that a knowledge of what men like and think and do is essential to success. The inception of any architectural undertaking grows out of the desire of other people to erect a building. The material carrying of it out is done by other hands than the architect's under the control of another head, often fuller of the desire to make money than to make a building; and the whole undertaking is beset by difficulties, emergencies and varied transactions, in which the architect has to unravel one tangled skein after another with different people. In short, from that early stage in his career, when an architect has to establish his position, make a connection, and inspire confidence sufficient to induce persons to put their work into his hands, to the close of the transaction, when the last instalment of his own fees is paid him, he has need of tact, resource, a command of temper, presence of mind, good common-sense, the ability to write a clear letter, and, in short, the qualities, natural and acquired, which enable a man to get on well with his fellow-men. All this must be combined with a knowledge of affairs. All this intercourse with other people rises out of matters that have relation to the buildings, or the site for them, or the materials of them, or the uses they are to be put to, the laws affecting them, or the customs, or the prejudices, or conflicting interests of the folk who have to deal with them. Now, in every one of these things the architect or chief builder, if he is to be chief, must be sufficiently posted up to take the lead. He must be familiar with such of the forms of transacting business, correspondence, accounts, vouchers, etc., as are used in building affairs, and such laws, customs, rights, as are incidents of or affect his work, and, in addition, with an infinite number of things that bear on it only indirectly. Estimates, accounts, the value of the things that are used in making buildings, the value of buildings themselves, and of the land they stand on. Road-making, repairs, light and air, the statute and common law as affecting buildings and property — on all these affairs he is expected to be able to give advice, and sound advice. He ought to know something about every use that a building can be put to, and though so much is almost unattainable, yet he ought to be constantly approaching to such a state of unusual knowledge of what goes on under all roofs the longer he lives.

Drawing and Art. — We build our buildings on paper to an extent never hitherto practised, but rendered apparently necessary by the modern contract system; but more than this, we study with the pencil when we examine existing work. The pencil aids to develop and fix our ideas when we are designing; with the pencil we make our intentions clear to our clients, and at a later period to the surveyors who prepare the estimate, and the artisans who carry out the work. Drawing, then, is a most essential — the most essential of acquisitions for an architect. The best draughtsman may possibly never make an architect, though I do not think such a result need often occur; but no architect can hope to succeed at the present time who does not draw well, and is not familiar with all that ought to be and habitually is done in drawing out architectural designs, plans, and details from first to last. Familiarity with plans is *not* a substitute for familiarity with building, but it is an admirable introduction to buildings, and the best possible aid to the mastering of them. The draughtsmanship that is necessary will extend beyond familiarity with plan-drawing. A good draughtsman must have so far mastered the use of the instruments as to be able to *think* through his bow-pencil or his straight-edge, and he must be able to draw all the ornaments in his buildings, including representations of the human figure, that his drawings shall be serviceable guides to the workmen. He ought to have mastered perspective, and to be at home to some extent in color. Finally, in the use of these means, he should have the feeling and inspiration of an artist, and he should have sympathy with and a knowledge of other walks of art as well as his own. Art which I have named last, on the principle on which the most famous performer is placed at the foot of a play-bill ("*and* Adelina Patti," for example), is that which determines the level at which our architect shall work.

If he can be the artist in feeling and training, and in what he designs, his work may be noble architecture, and certainly will be good. Being an artist, be it remembered, relates to everything that develops a sense of beauty in form, line, and color, and in all the allied parts as well as in our own. I need hardly point out that this considerable range of knowledge and experience will take years to acquire — in fact, it is the work of a lifetime; but what we are concerned with is that approach to it which justifies a beginning. This ideal portrait is not often, however,— even if time enough be taken, — carried out symmetrically and completely. Opportunity enables a man to accumulate experience, knowledge and skill in one direction. The lack of opportunity, or of will, or taste, cramps him in another; and so it comes to pass that most men are better in one walk of the profession than in another — fortunate if they are able to find that class of work for which they are most fit. In passing, I ought to point out that more than one of the matters that figured in our enumeration of the cultivated man's acquisitions or methods are almost essential to the architect. This is especially the case with his drawing and his cultivation of the fine arts. He, almost alone of all professional men, should, as a matter of course, include foreign travel as a part of his training. He also, in common with all professional men, should cultivate his mind and powers by Bacon's method of reading, writing, and social intercourse. In short, he should be a cultivated man. I now turn to the standard which has been set up by the Royal Institute of British Architects as marking what they consider should be the attainments of a young architect before he is admitted as an Associate of that body. This standard we find set forth in the programme of the examination and in the specimen examination papers published, and though my statement is in less detail than the series of subjects of examination, you will find that those subjects group themselves under my broader headings perfectly well. My first heading is "Buildings." To the subjects which I embraced under this head the programme allots 400 out of the total of 700 marks, divided as under: History of architecture, 100; mouldings, features, and ornaments, 100; sanitary science, strength of materials, and shoring, 100; materials and construction, 100. You see that the largest demands, even when a deduction, which I shall come to directly, has been allowed, are made under this head. This is partly on account of the fundamental importance of a knowledge of buildings, and partly because fair opportunities for acquiring that knowledge are open to you in your student days. My second head was "Men and Affairs." This comprises two heads in the examination programme, between which 100 marks are allotted. They are: Specifications and estimating, 75; professional practice, 25. The first of these two subjects most students can easily acquire, and skill

[1] A lecture by Prof. Roger Smith before the architectural class, University College, London.

in it can be readily tested by examinations; but much of the knowledge comprised under the head of professional practice cannot be acquired till later in life, so but few marks are allotted to the subject; moreover, the skill, tact, self-possession, and judgment needed for the transaction of business are not matters in which a candidate can be directly examined; though, as far as they come out in his *viva voce* examination, they will be sure to have a share in examining the result.

My third head, "Drawing and Art," is directly represented by one heading only, Plan, Section and Elevation, to which two hundred marks are allotted. Of course a proportion which the programme does not disclose of the marks allotted to the first group of subjects will be given to the sketches with which the answers are to be illustrated, and, as far as they go, these marks will increase the proportion devoted to drawing and art at the expense of those devoted to knowledge of buildings; but it is not likely that this could ever take place to so great an extent as to equalize the two. This examination grows, as you know, out of the voluntary examination, which acted as a pioneer to prepare the way. I had the honor of having some share in preparing the preliminaries of that examination, and am, alas! the only survivor of the five who acted as examiners and moderators on the first occasion, the others being Scott, Digby Wyatt, Ashpitel and John Papworth. Some of those who organized and subsequently recast the scheme still remain — among them, I am happy to say, my immediate predecessor in this class, Professor Hayter Lewis, to whose initiation as Honorary Secretary to the Institute, more than to the action of any other person, we owe it that to-day we have an entrance examination for Associates of the Institute. The advantages which it was considered that students would obtain were, first, that the programme would make it clear what directions, in the opinion of persons qualified to judge, an architect's studies and his preparation for the serious work of his profession ought to take; and, secondly, that the examination itself would establish a standard of attainment which it is not unreasonable to expect that every student with the usual means of study at command shall reach before he looks upon himself as qualified to practice.

The Institute by adopting this examination as the door through which every Associate must enter, had in one sense doubled the value of it, for it had added a double stimulus to work. Passing has always been a distinction; but now failure to pass entails a very serious professional disability. Of all things I should deprecate — and I think in this I should speak the feelings of the examiners and Council generally — I should deprecate this examination being looked upon, or coming at any future day to be looked upon, as an arbitrary test. It is intended to be, and I think is so worked by the Board who undertake it, as really to be a test of qualification. That is to say, a man is not held fit to be admitted to the Institute because he has passed the examination, but because he has fitted himself to perform the duties of an architect, and the examiners will direct their questions so as to satisfy themselves of this fact only. Whenever, or if ever, the examination fails to keep up its character in this respect, if it admits what are called catch-questions, and sinks to the level, for example, of the Civil Service examinations, where a man is passed as a consequence of his having temporarily worked up certain subjects, it will fail of its real object. Consider, then, that your duty really is to prepare yourself for practice, and that this examination is an incident in such preparation. And do not consider that you are to prepare yourselves for examination, and that if you can worry through you are sure to be right as far as fitness for your professional life goes.

If we have now arrived at some clear understanding of what you require to prepare you for practice, the only questions which it remains for me to deal with are first, the broad question of how generally you are to obtain it, and the narrower one of how much of it you can get here from me? I am not going to delay you in order at any length to examine any scheme of architectural education not at present in actual force, and within reach. Such an examination you will find in the reports in the professional papers of the Conference on Education held in May last. I should, however, like to refer, before I pass from the subject, to the programme of instruction in several of the American colleges, which, through the kindness of Mr. Cates, have been brought under the notice of many architects. In these programmes a course of scientific instruction is in each case provided, lasting several years, and taking in its turn history and draughtsmanship; but without enough attempt, so far as I can see, at securing for the student any familiarity with buildings. I trust that if these are seriously examined as precedents, it will be by the help of the light thrown upon them by observations from the pen of Mr. Wace appended to them. The American schemes appear to me too theoretical, not artistic enough, and in other ways not suited as models for an English course of architecture, should such a course come to be established, as is very probable. It will be even less necessary to raise the question of technical education for artisans, which is one of the most important ones of the present day.

The subject before us to-night is, it is true, to a great extent, a branch of technical education, for it relates to the education of the architect for the exercise of his art, and time will not serve us to travel outside its limits. I propose to pass at once now to the question of how, with the opportunities that London at present offers, you can be educated for your profession? Even that stage of preparation which the Institute examination marks cannot be reached without *time*. To become a great architect is the labor of half a lifetime. We have, however, had great architects in this country, and have them now; so it is clear that whether our appliances and methods are the very best or not, at least they *can* suffice. I once heard one of the greatest of modern water-colorists exclaim, before a gathering of artists, "It is not the water in the brush, but the spirit in the man that makes a painter in water-colors!" This is quite true; and if we take any great architect — say, Sir Charles Barry — it was the spirit in the man that made him what he was; still, the water-colorist does have water in his brush, and Barry reached his eminence by some path. Let us turn to the published memoir of him, and ask what was that path? Pupilage for a long term, travel for a long term, and then continuous effort — first to obtain, and then to carry out, responsible practice — is the answer that we shall obtain. Now, that simple programme will form the outline of the only course at present open to the architectural student of the present day, and I recommend both parts of it to your cordial adoption, not necessarily as the best possible programme — on that I offer no opinion here — but as the best possible in London in the year 1887; and I will endeavor to show how much pupilage and travel themselves can do for you, and what can be done to fill out, add to, and supplement these two cardinal elements. With or without sound preliminary training, let us suppose that the student begins his career as a pupil. The life of Barry tells us that he was articled for and worked out seven years. This is not perhaps too long for a man to work at the drawing-board, but it is too long to be in one place. The term now fashionable is three years, which is too short, and I believe that, as a rule, four years is a very useful term, and that then most men had better change, and spend two other years seeing the practice of other offices as assistants, and, as a rule, as paid assistants. I have not much to suggest to pupils; but I ought to point out that what is really intended to be done for them is not to teach them as they were taught at school, but *to give them a chance*. In consideration of the premium he has paid, a young man who for a long time is more of a hindrance than a help is tolerated in a place where the work would go on better without him, and it is an understood thing that he is to be allowed opportunities of learning if he will use them. This — though it may not sound a very precious privilege — is really of far more value than most young men have the remotest idea of, and the great danger, especially for students who come straight from school and have not had the training in self-culture which college affords, is that the opportunities may not be properly made use of. Let me urge on the notice of any pupils who may hear me, half a dozen or so friendly hints: First, to consider no trifle beneath their notice; secondly, to recognize that to acquire habits of punctuality, order, the mode of conducting simple affairs, endorsing letters, conveying messages, etc., are all essential to their success in after-life as business men; thirdly, to do everything entrusted to them as well as they can, but as far as possible to secure the difficult jobs and pass the easy ones on to some one else; fourthly, to let nothing pass that they do not understand without extorting an explanation from some one; fifthly, to visit the buildings on hand and the builders' workshops whenever there is a chance; lastly, to make sketches and notes of every possible thing, insignificant or otherwise. A pupil who will spend his four years in the practice of this line of conduct will leave the office a good deal nearer being an architect then he entered it. It is, perhaps, right to add that though I may have given what does not seem a very brilliant account of pupilage, and though I am about to show that it must be supplemented somehow, I do not think that what it supplies can be got elsewhere.

So practical a pursuit as an architect's business can, I think, only be learned by taking part in the actual conduct of it, and, though many pupils would do better had they spent some time in preparatory study before being articled, I see no reasonable prospect of any system being introduced to supersede pupilage without great disadvantage. In the pupil's career I include any subsequent time spent in somewhat similar work, though under the name of an improver or assistant. A still more useful addition to a pupil's course is a time spent in a position somewhat analogous to that of a clerk-of-works, or as resident-assistant to a clerk-of-works, or as resident-draughtsman on some building. Naturally, this is a rare chance. Very few pupils of five or six years' standing, if any, are really fit to be of much service as clerks-of-works, but if they can in any capacity spend some time on a building, they will find opportunities for acquiring practical knowledge that are invaluable.

[To be continued.]

TESTING EXTERIOR STAINS.

SINCE the use of stains for exterior work became so general, several stains, some good and some bad, have appeared on the market so that a few points on estimating their comparative values may not be amiss.

The nose, and to a less degree, the eye, are admirable allies for this work, but unassisted are not infallible. The following is about the simplest method of testing:

1. Search for kerosene by warming and then noting the smell. Also, note the thinness and lack of covering-power which kerosene causes. Kerosene is simply a cheapener.

2. See how fine it brushes out on a smooth shingle. There should not be the slightest grit or any perceptible grains of pigment, the presence of which will prove that the coloring was mixed dry with the vehicle and was never ground fine.

3. Pour out some of the stain in a tumbler. If it begins to settle at once, except in the case of a chrome-yellow or green, it is made

as above stated, by mixing a dry paint with the vehicle, and therefore should be avoided.

A well-ground oil stain tested in this way held up a whole day, and a creosote stain a day and a half.

Of course, when debating between two stains it is best to try them side by side. In such a case the comparative color-strength may be determined by diluting equal quantities of both stains of about the same shade, with equal quantities of turpentine and then applying the diluted colors to wood and noting the depth of color. One part of stain to ten parts of turpentine is a good strength.

A wise precaution is to conceal the fact that the samples are for trial as the makers, so far as known, are mortal.

They should be bought by some one not known as an architect.

SOCIETIES

ARCHITECTURAL LEAGUE OF NEW YORK.

AT the last meeting of the Architectural League it was decided to select for the exhibition to be opened on December 19, a jury of five, of whom three were to be non-members of the League.

The jury selected is: Mr. Richard M. Hunt; Mr. Charles McKim; Mr. Augustus St. Gaudens; Mr. Edward H. Kendall; Mr. Clarence Luce. (The last two are League members.)

CHARLES I. BERG, *Secretary.*

COMMUNICATIONS

A CORRECTION.

BOSTON, November 12, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In "Theatre Fires — Remedies," in eighth paragraph, fourth line, for "right lines" read "sight lines."

Yours truly, JOHN A. FOX, *Architect.*

THE EFFECT OF LIME AND CEMENT ON IRON.

CHICAGO, ILL., Nov. 7, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In the current number of the *American Architect* mention is made of the use of salt to preserve cement-mortar from the bad effects of freezing. If there are no objections to its use, to offset these advantages, the information is of great value, except that no statement is made of the proper quantity of salt to use. Could you, in your next issue supply this omission? I have been told by a German contractor — a graduate from one of the European Polytechnic Schools — that it was customary in Germany to put salt into the holes bored through oak posts and columns as a preventive to decay; and from another source I have learned that salt in the brown plaster coat is resorted to in some parts of Canada in extremely cold weather, but this latter use of salt seems open to an objection from its well-known property of attracting and absorbing moisture and the danger of unsightly efflorescence. I do not know that this objection would really arise, as I have never tried it, and would be glad to hear from any one who has. I should also like to hear from any one who has had practical experience in the use of salt in cement-mortar, and as a preventive of decay. Also (while I am about it), from any one who has had practical reasons for believing that cement is more corrosive to iron or steel than lime-mortar, or the reverse, both of which assertions have been made, to my knowledge, by persons claiming to know. Respectfully,

O. J. PIERCE.

[THE question of the proportion of salt to use in mortar was answered in our last issue. We have never known salt to be used in the first coat of plastering mortar, and should think it would be likely to cause yellow stains in the finishing coat. In the last coat it would, perhaps, not be objectionable in our dry climate. As to the influence of cement and lime upon iron, we think it is well settled that ironwork buried in lime-mortar or in masonry laid in such mortar is preserved from rust; and iron ties in perfect condition have been taken from the interior of walls laid in lime-mortar which had been undisturbed for more than six hundred years. This preservation of the metal is due to the alkalinity of the lime by which acids, particularly carbonic acid dissolved in water, the great enemy of iron, are neutralized before they can attack the metal, and so effectual is the protection that in fireproof building it is still common to give exposed iron a coat of whitewash before painting it, in order that the lime may defend the metal against the action of the feebly acid carbonate of lead in the coats of paint put on subsequently. With masonry in cement the case is somewhat different. Although the cement has no acid or corrosive action, it is so feebly alkaline that it does not protect the metal effectually against the carbonic acid present in moist air, and iron in cement work exposed to moisture will rust. Singularly enough, both cement and lime, where water is present, will corrode lead, through a chemical action not as yet very clearly explained. — EDS. AMERICAN ARCHITECT.]

THE PROPER FEE FOR AN ARCHITECT COMPELLED TO ACT AS CONTRACTOR.

MONTGOMERY, ALA., November 9, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In the case of the Wyandotte, Kansas, architect, I will give you my way of doing. I have to finish up several houses at this time in the very way he speaks of, left by defaulting contractors. And the only way to get at a proper compensation for my services in addition to my commission, as architect, is to charge so much for each day until the work is finished. I do not desire the position, but sometimes we can't get a contractor to take the work at a reasonable price, and then again we can't get a competent man to fill the place. That is the only way I know of. It seems to me to be the only way that it can be done to give all parties justice.

Yours truly, R. N. MCGRATH, *Architect.*

NOTES AND CLIPPINGS

ARTESIAN WELLS IN SOUTH AUSTRALIA. — Scarcely second in importance to the grand gold discovery is the success which has, during the past year, attended the operations of the Water Conservation Department. In the month of September a bore made by the diamond drill at the Hergott railway station, on the Great Northern line, which is being gradually extended across the continent, struck a strong spring at the depth of 348 feet. The water rose and flowed over the surface at the rate of about 3,600 gallons per hour, gradually increasing to 4,000 gallons. On pipes being fixed to convey it into the elevated tanks, placed at a height of 60 feet to supply the locomotives, the water rose to that height and flowed into the tanks. The supply still continues unabated. Shortly after this another bore was put down at Strangways Springs, about 65 miles northwest from Hergott. Here, at the depth of 308 feet a much stronger spring was struck, the water rising with considerable force in a fountain 9 feet in height, at the rate of 1,000,000 gallons per day. The surrounding country being flat, was soon flooded for miles around. Unfortunately, the presence of a small portion of magnesian salts in the water rendered it unfit for irrigation purposes. It has, however, since improved in this respect. A third bore in the same district, and about 25 miles distant from the former, and in a northerly direction, has also been successful. It should be stated that in these localities there were natural springs previous to the boring, but the supply of water from them was limited. The quality of the water is excellent, quite good for domestic use as well as for stock. The source of supply is supposed by geologists to be in the great dividing range on the southern part of Queensland, some 700 miles distant from the site of the bores. The rainfall on this range is enormous — 60 to 70 inches in the year — and it is supposed to percolate through the strata until it reaches a retentive stratum which appears to continue in the form of a huge basin for the distance mentioned. It is therefore considered probable that over this immense area artesian bores may be sunk with the certainty of success. Another most important discovery of water has been made in a part of the country more in need of it than those just mentioned. It is in the southwestern portion of the province, near the border of Western Australia, on the "Mellabar Plains," hitherto a waterless country, and having a limited rainfall. The bore was put down to the depth of 749 feet, when a spring of fine water was struck, which rose to within 150 feet of the surface. The benefit to the country resulting from these artesian wells will be very great. Another bore is now commenced a few miles further inland, in the southwest district. The Government is also very anxious to provide a supply of water for the diggings, and it is probable the drills may also be set to work in that locality, though the Conservation of Water does not think favorably of the prospects of deep boring there. In the settled districts a considerable amount of important work has been done in forming, repairing, and cleaning dams and reservoirs, in sinking wells and artesian bores in different parts of the country, with such successful results that provision has been made for a *daily* increase of consumption of 742,408,228 gallons. The expenditure of the department totaled £67,350. — *J. W. Smith, Consular Agent.*

PAINTING ON CEMENT. — According to the *Bulletin de la Ceramique*, it is known that the caustic lime which is not in a state of combination in cement saponifies the oil used in painting. Consequently painting on cement is only practicable when, under the influence of the air, carbonic acid has united with the caustic lime to form carbonate of lime. When it is desired to paint cement without delay, attempts are sometimes made to neutralize the lime by acids; but the above-named journal recommends in preference the use of carbonate of ammonia, the acid of which combines with the lime while the acid is liberated. The effect produced is, however, only superficial. Various other expedients are referred to, but the solution of the problem would seem to consist in the use of caseine. Fresh white cheese and slaked fat lime are added to the color. This mixture hardens rapidly, assumes the consistency of stone, and is insoluble in water, a formation of albuminate of lime taking place. It is according to this system that the mural paintings at the Berlin War Museum were executed.

To make the composition, three parts of cheese and one of slaked fat lime are stirred, the quantity of color to be added being regulated by practice. Only earth colors or oxides of iron would be used for light red to dark brown shades; for blue, ultra-marine or cobalt blue would be used; for white, oxide of zinc or sulphate of baryta; and for black, animal black. Inorganic colours, such as those of aniline, would not be used, nor would Prussian blue, vermilion, blue ochre, and white lead be employed, on account of the injurious effects of the sulphur present in the cheese in combination with these substances.

If he painting surface is too dry it can easily be damped. The caseous lime should be prepared daily, and the brushes should be cleaned after the application of each coat of paint. The process thus described is recommended for its economy, the walls of a house being painted as fast as the scaffolding is removed. The caseous paint does not easily take fire, and is therefore considered particularly suitable for the decoration of theatres, and for application to stage-carpenter's work generally.

The Ultimate Destination of Dr. Schliemann's Treasures. — Dr. Schliemann has made a will leaving his valuable collection at Athens to the Ethnological Museum at Berlin.

A Tower on the Mount of Olives. — The tower which is being erected by the Russians on the highest point of the Mount of Olives is already several stories high, but one more is to be added. The object is to make it so high that both the Mediterranean and the Dead Sea may be seen from the top. A number of bells will be placed in the tower. In digging the foundation several Christian graves were found, together with an inscription in Greek, in which the word "Stephanus" could yet be deciphered. — *Home Journal.*

A Twelfth-Century Bill. — An itemized bill of the twelfth century is old enough, in all conscience, but this one from the records of Winchester Cathedral, dated 1182, may be new to most people:

	s.	d.
For work done in soldering and repairing St. Joseph....	0	8
Cleaning and ornamenting the Holy Ghost.....	0	6
Repairing the Virgin Mary before and behind and making a new child.....	4	8
Screwing a nose on the devil, putting in the hair of his head and placing a new joint in his tail.....	5	6

The total bill amounted to eleven shillings and fourpence, and it is to be presumed that the workman got his pay, though the records are silent on the point. — *New York Sun.*

Testing pile-Protecting Compounds. — In 1882 several piles, coated with various patent anti-teredo coverings, were driven in the harbor of San Francisco for the purpose of testing them. Last week Engineer Manson began pulling up the piles in order to see the result of the experiments. A pile coated with Pearce's compound, composed of paraffine, limestone, kaolin, etc., was found to be completely honeycombed by the teredos. The eucalyptus and cedar piles were also nearly destroyed. In 1884 the two piles encased by A. W. von Schmidt in sewer-pipe and cement, the twenty-three coated by Frank Shay with asphalt and wire-cloth, the ten of McKeon & Co., coated with warm cement containing a poisonous substance, and those of W. H. Hayes coated with Portland cement, etc., were examined by Colonel Mendel and Mr. Manson. All showed signs of having proved failures. The insect is ahead of the inventors up to date. — *Exchange.*

The Bastile Rebuilt. — The "old Bastile" is in course of construction on the Champ de Mars, and, owing to the progress which has been made with the works, much of the illusion which is intended to be effected may be realized at the present moment. The constructions are at the corner of the Avenue de Suffren and that of La Motte Piquet. The grim fortress appears with its crenelated towers above and ditches below. By its side is the Porte Saint Antoine, and not far away the Church of Saint Mary, a masterpiece of the architecture of the seventeenth century. At hand, also, is the Hôtel de Mayanne, and all these old-fashioned and picturesque places do certainly recall what they are intended to represent, although much of their retrospective interest is somewhat marred by the very modern surroundings of the adjacent Trocadéro, the high nineteenth-century houses, the mass of iron which will soon be Eiffel's Tower, the Military School, and the steamboats which run snorting and puffing over the surface of the Seine. — *London Daily Telegraph.*

The New Capitals at the National Academy of Design, New York. — At the National Academy of Design the carving of the capitals of the corridor pillars has just been completed after waiting nearly a quarter of a century. The work has been done through the contributions of a few patrons of art, Messrs. John Taylor Johnston, Henry G. Marquand, Cornelius Vanderbilt, William E. Dodge, S. P. Avery, Daniel Huntington and J. Q. A. Ward. The seven marble capitals have been carved in conventionalized designs of flowers, fruit, and vines by a local firm of architectural sculptors, each of the donors named selecting one capital as his special gift, and in some instances designating it by some appropriate emblem. Thus a mallet appears among the leaves of the carving presented by the sculptor, Mr. Ward, while the head of a winged bull, symbol of St. Luke, painter as well as physician, looks from the marble flowers given by Mr. Daniel Huntington. Underneath a garland of pears and leaves encircling Mr. Avery's capital is a group of engraver's tools, significant of his former profession. The thistles of Scotland and a wreath of roses form the design of Mr. Johnston's capital. Mr. Vanderbilt's capital has been carved in grapes and grape-leaves, Mr. Marquand's in callas, with the prow of a boat beneath, and Mr. Dodge's in lilies with a fish below. The corbels, carved in lower relief on the inner and outer sides of the arches, present among other ornamentation, the initials of the respective donors, whose graceful act has furnished a much needed enlivenment of the bleakness of the corridor. — *Home Journal.*

TRADE SURVEYS

There are two features among the many upon the surface of trade which are deserving of special consideration with those who are endeavoring to formulate opinions as to next year's probabilities. One is the extraordinary growth of Building and Loan Associations, and the other is the multiplication of projects for building and manufacturing purposes. If there were any apprehensions of a permanent reaction in industrial activity, they are rapidly disappearing. The stock markets exhibit an upward expanding tendency in values. The bulls are having a holiday, and a spirit verging onto stock speculation is beginning to manifest itself in not only Eastern, but in some smaller Western commercial and financial centres. It is roughly estimated that $750,000,000 are finding employment through the channel of Building and Loan Associations, but whether this figure is near or far off the mark, the facts which are known justify the statement that this system of co-operative banking and loaning and buying is expanding with great rapidity, especially throughout States west of the Allegheny Mountains. It was thoroughly tested in Eastern cities, particularly in Philadelphia, and the importance of it will soon become recognized throughout Western cities and towns. Associations have been formed very rapidly this year, and in nearly every Western town steps have been taken to organize the producers into house-building societies. These associations are valuable in their educational features, for they lead to the discussion of questions, to habits of thrift and economy which would never be otherwise developed. It is shown by creditable statistics that for the past ten days over one hundred million dollars' worth of projects have been heard of, and the statement is made upon the same authority, that the spirit of investment is likely to manifest itself more strongly later in the season. The money-market is easy and rates of interest are low. Financial and commercial operations in Western cities, such as Chicago, St. Louis, St. Paul, Kansas City and some others, all show an enormous distribution is going on, and that enterprise is still seizing opportunities of every variety. There is nothing as yet in the horizon to justify much of the apprehension that is expressed in some trade journals. In Philadelphia, during the past ten months, 6,079 two and three story houses have been erected, and in all 6,640 buildings, including warehouses, factories, churches, schools, etc.; the total estimated value of which is, in round numbers, $24,000,000. The builders and architects of that city, in interviews this week, state that the indications for the coming season are fully as encouraging as a year ago. A great deal of land both in and near the city, has been purchased for next year's building requirements. Reliable building authorities in New York say that large purchases of land have been made in suburban localities for building purposes in the upper end of the Island as well as on Long Island. Real estate in the more desirable localities has been steadily advancing in value, although not to the point of prohibiting enterprise. Statements from Chicago within a few days show that there is much to hope for in not only that city but throughout the Northwest next year. While it may be true that railway building has gone a little way ahead of present requirements, no well-informed architect, or builder either, says there are good grounds for believing that building of houses and of manufactories will decline. A great deal of local capital is seeking investment, and outside capital is attracted thither by the good rates of interest offered and the satisfactory results of the investments of the past two or three years. There is another feature worth mentioning at this time, namely, that a great deal of railroad building is projected. The rail-makers held a meeting in Philadelphia this week to decide whether to restrict production or to reduce prices to a non-competing point. There are inquiries for over 100,000 tons in the market. If prices can be fixed it is probable that within thirty days contracts for no less than 500,000 tons of steel rails will be placed. Buyers are expecting to purchase at $30; this is $10 below the price of early summer, and $4 above the lowest point reached nearly two years ago. The anthracite coal miners and consumers are greatly exercised over the probabilities, on the one hand, of a continuance of the strike, and on the other hand of an advancing tendency in prices. A general advance of twenty-five cents per ton will be made on Monday. This advance will affect prices throughout New England States as well as throughout the West. Large shipments are being hastened to Western markets in view of the nearness of the close of navigation. There is a general scarcity of anthracite, but the production, which averages about one hundred and fifteen to one hundred and twenty thousand tons per day will be sufficient to meet the actual demands. The strike will probably continue for two or three months yet unless the companies give way. They announce their purpose of holding out and certainly will not surrender under any circumstances that can now be foreseen. The Connellsville and mountain coke production is about 15,000 tons per day, but with the completion of furnaces now under construction and projected, the production will be not less than 20,000 tons. Extraordinary preparations are being made for an increase of the coke production in the Southern States, and much local and outside capital is finding attractive inducements in this rising industry. There are indications that the employers throughout the country are gaining points as against labor organizations. The boot and shoe manufacturers are about forming a national organization. The building-trades throughout the country are pretty compactly organized, and have held their own in recent conflicts. It is earnestly desired by builders in all sections of the country to adjust all differences during the winter in order that calculations and contracts can be safely entered upon for material for work during the next year. The workmen themselves are coming to recognize that a conservative course on their part is more desirable than an extreme one, and it is quite probable that measures will be mutually agreed upon which will obviate a suspension of work after the opening of the busy season. While it is largely a matter of opinion as to the extent of building enterprise next year, the very best authorities among architects and builders lean strongly to the belief that there will be very little, if any, decline in building activity. Throughout the West the municipal authorities are arousing to the importance of extending school facilities, and a great deal of work of this character will be entered upon. In the great multitude of Western and, in fact, Southern towns, it is evident that there will be a vast amount of shop, factory and house work undertaken. There is an abundance of capital available, and at low rates of interest. Local authorities have been investigating the conditions surrounding the outflow of Eastern financial centres to Western farms, and the investigations show a very encouraging condition of things. Capital which, in years past, was clogged up in Eastern vaults is finding a welcome in the West, where enterprises of almost endless variety are assisted and stimulated in the furtherance of the diversification of industries upon which permanent prosperity depends. The encouraging features of trade and industry above enumerated, as well as in the railway enterprises, are largely due to the great ease in the money-market, but there are a number of minor and less-observed influences which have lead to this result. Manufacturers, jobbers, bankers, investors, and others want to say the prices are going to be somewhat easier. The possibility of an upward tendency in prices is generally given up. On the other hand, the demand for shop-room, house-room, and room of all kinds, as well as for more rolling-stock, more steam-power, and more electrical power of every variety, is strengthening the productive agencies and leading all manufacturers to feel that there is a busy time ahead of them for months to come.